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MODERN MECHANIX

OCTOBER
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OCTOBER 1937

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NEXT MONTH

While the test pilot still plays an important part in the progress of aviation, science has developed instruments and testing machines that have served to make his precarious work less necessary. In ingeniously designed "super" wind tunnels, aeronautical engineers now submit new aircraft to tests emulating those of the test pilot, and—without risking a single human life. In an authoritative article—"Scientific Aids To Test Flying"—Bob Gordon tells you all about the wind tunnel tests conducted at the aeronautical "house of magic" operated at Langley Field, Va., by the National Advisory Committee for Aeronautics. Photo—Testing a wing.

FOR WORKSHOP FANS

Among the many interesting projects included in the November issue will be—A Swinging Arm Sander; A Modernistic End Table; An Electric Phonograph; A 6-volt Power Plant; A Simple Radio Receiver; and a host of other plans, suggestions, and practical workshop kinks that will supply ample outlet for your skill.

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Simple Inventions May Have Excellent Commercial Possibilities

FREQUENTLY inventors confuse the size of the complication of a device with the question of commercial value and patentability. These two factors, of course, have no relation to each other. Most of our present-day complicated machines represent a process of evolution, a series of inventions. On the other hand, ever so often some inventor comes along with a very simple "gadget" which possesses the elements of broad utility and is patentable. Some of the most profitable inventions have been of this latter class. Shown above are a few such examples. Whether a device is simple or complex, if it represents a forward step to save manufacturing costs, to save labor, or to add enjoyment to human life, it may prove patentable and profitable. This subject is more fully discussed in the booklet entitled "Patent Protection" shown on the opposite page.

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Random Chips from

Built from MM plans by Antonio Mateos, Jr., of Oriente, Cuba, this "Sunray" sailboat features good performance as well as good appearance. It placed third in contest with 23 boats, attesting to its keen design and skipper's skill.

COPIES of MM reach many foreign lands and we note with pleasure that our foreign readers are also very much interested in workshop projects and have turned out some excellent boats, radios, model trains, model airplanes, etc. Proof of this fact lies in the photos we have received.

To one of our foreign readers, Antonio Mateos, Jr., of Oriente, Cuba, goes this month's Workbench first prize of $5. He says:

Dear Editor:

I am enclosing a photo of my "Sunray" sailboat which was built from plans in the MM book—"How To Build 20 Boats". In a regatta held here, the sailboat placed third in a field of 23 contestants.

I am now considering the idea of building another boat, not to exceed 16 feet, and would like you to send me the latest copy of your blueprint catalog.

Antonio Mateos, Jr.

Pleasing to the eye and, apparently, pleasing in performance, Mateos' "Sunray" certainly reflects her builder's skill.

***

Another foreign reader, Alan Rea, of Melbourne, Australia, wants to correspond with American model builders. He writes:

Dear Editor:

Just a few lines to let you know I have been a regular reader of MM for several years. I like the simple radio articles and workshop kinks best.

I do not care for your articles on football or baseball, but that may be because we do not understand your game down here. Please tell other readers (16-17 years old) that I would like to correspond with them about model building. My address is—45 Lansdowne Rd., East St. Kilda S2, Melbourne, Australia.

Alan Rea.

Here's your chance to make a "Pen-Pal" in the land "way down under". From our contacts we can assure readers that the Australians are real good modelers.

***

Remember the "Flying Flea" airplanes that appeared in France several years ago? For a time the newspapers and magazines were filled with articles and photos concerning the novel looking aircraft, but interest seems to have died out. Perhaps the fact that several governments banned the flying of the "fleas" is responsible. At any rate, reader Aubrey W. Burton, of Reliance, Neb., has built one of the peculiar looking planes and his letter and photo won a $3 award. The letter reads:

Dear Editor:

Enclosed is a photo showing my own idea of a "Flying Flea" airplane. It was built during my spare time and I will be glad to supply more information to any of your readers, providing they enclose a stamped, return envelope with their inquiry.

The plane is now powered with a Lawrence motor, but I am going to put a converted Ford engine in it soon.

Aubrey W. Burton.

Our host of home-built aircraft fans will undoubtedly take advantage of Burton's kind offer

Unusually novel in appearance, this "Flying Flea" type of airplane was constructed by Aubrey W. Burton, of Reliance, Neb. It is copied from a popular design originated in France.

the Editor's Workbench

to supply full information about his plane. Go to it, fellows, but don't forget the stamped envelopes.

•••

Midget racers still have their boosters among MM readers and a letter from J. C. Whittington, of Ware Shoals, S. C., was awarded a $3 prize. He states:

Dear Editor:

Using a design copied from your Midget Miller racer in the "How To Build It" book, I constructed a racer, a photo of which is enclosed.

Can you imagine a car, 30 x 66 inches in size, equipped with a two-cylinder 15 h. p. opposed motor (1920 model) and having a three-speed transmission as well as a 10-plate clutch? The engine is placed at the rear and the generator charges a battery placed under the front hood. The car travels along at 40 m. p. h. comfortably.

I enjoy reading MM, particularly the articles on trailers and midget racers.

J. C. Whittington.

Good work, Whittington. We hope you'll tackle the Arlen Special racer, which was described in the past few issues.

•••

Want to simplify the job of mowing your lawn? If you do, a letter and photo from Arnold R. Tolley, of Hagerstown, Md., will interest you. His $3 prize winning letter reads:

Dear Editor:

Here is a snapshot of a gasoline lawn mower which I made from a washing machine motor and a few old bicycle parts. The device works well and is a great help.

I hope this project is interesting enough to warrant use in MM. I always read about other readers' ideas as presented in your magazine and enjoy this feature immensely.

Arnold R. Tolley.

A washing machine motor and a few old bicycle parts were used by Arnold R. Tolley, of Hagerstown, Md., to change his old hand lawn mower into a practical powered mower.

We wouldn't be surprised if a great many readers write in for more details about your power mower, Tolley. Practical projects always seem to "click" with MM readers.

•••

Don't forget that the new edition of "How To Build 20 Boats" is now available. Filled with practical articles and plans for building various types of boats as well as with money-saving kinks, the book can be purchased from your local news agent, or direct from Modern Mechanix, Greenwich, Conn., for the small cost of 50c per copy.

•••

Another foreign reader who won a $3 prize for his project letter is Arthur V. Zahara, of Sliema, Malta. He says:

Dear Editor:

Enclosed is a photo of a skiff that I have built. I am waiting for a plan for another skiff or punt to appear in MM and then I will start building again.

I have not been a reader of MM very long, having started just a few months ago. However, I now plan to get it monthly, for I have found it to be well worth my money.

Arthur V. Zahara.

[Continued on page 18]

Powered by a two-cylinder opposed motor of 15 h.p., this snappy midget racer was built by J. C. Whittington, of Ware Shoals, S. C. Compare size with conventional auto at rear.

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Editor's Workbench Chips

[*Continued from page 15*]

To provide many hours of healthy outdoor activity, Arthur V. Zahara, of Sliema, Malta, constructed this two-seater skiff. The craft's design assures speed with minimum effort.

We think reader Zahara will find the new edition of the "How To Build 20 Boats" book much to his liking, for it features plans for several small boats such as he refers to.

■■■

Every reader of MM is invited to send in photos and letters describing completed workshop projects. Although we prefer to use photos showing projects constructed from MM plans, we assure our readers that equal consideration will be given to other photos.

Photos, upon being received at the MM office, are judged by the editors and the best photo received each month is awarded a prize of $5. All other photos used in the Workbench are awarded prizes of $3 each. The fact that a photo does not receive a prize one month does not mean that it will not be considered when the following month's judging is conducted. In fact, the photos are judged collectively *each* month, the best of those on hand being considered each time.

***

Have any of our readers had any experience with the building and flying of model airplanes powered with compressed air engines? Would you like to see plans for a model of this type? We would like to hear from modelers regarding these questions and would welcome photos of any models using compressed air engines.

***

What hobby do *YOU* think is the most popular in the United States? Perhaps you will be surprised to learn the answer which will be printed in our next issue, but at any rate you have plenty of time to send in a card or letter voting for your pet hobby.

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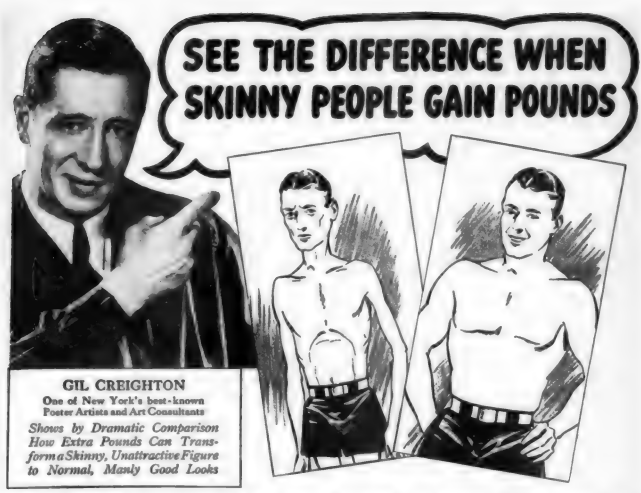

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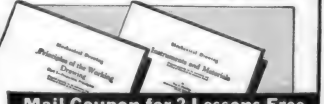

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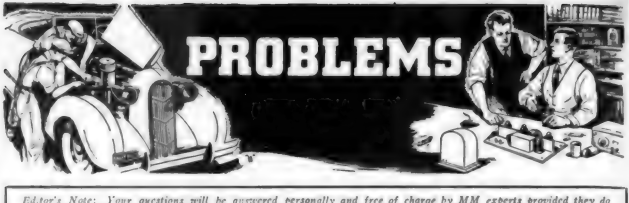

Editor's Note: Your questions will be answered personally and free of charge by MM experts provided they do not require special research or involve trade secrets. Names and addresses of manufacturers of new products described in this issue can also be obtained free upon request. Enclose a self-addressed and stamped envelope for reply. Address: Problems Editor, Modern Mechanix Publishing Co., 1501 Broadway, New York City.

OBTAINING PHOTOGRAPHS OF LIGHTNING

I have seen several good photographs of lightning in recent magazines and would like to know how the camera must be handled to obtain such photos.—William Lahrer, Brooklyn, N. Y.

The most satisfactory method is to place the camera on a tripod before an open window pointed in the direction of the most frequent lightning flashes. The shutter should be set at "time" and left open, using the largest opening. As soon as a flash of lightning occurs, close the shutter. Forked lightning will photograph well if this method is used. Try your luck.

CONFUSING AERONAUTICAL TERMS

Although I read quite a few aeronautical magazines in addition to MODERN MECHANIX, I am confused by the meaning of autogiro, helicopter, and ornithopter. Will you explain the difference between these types of aircraft? —Matthew Peters, Bridgeport, Conn.

A helicopter depends on mechanically operated rotor vanes for its lifting ability. An autogiro has rotor vanes, but they operate by the action of the air itself (when in flight) rather than by mechanical means. An ornithopter is an aircraft that employs flapping wings to obtain lift.

MEANING OF SPECIFIC GRAVITY

Frequently I have come across the term "specific gravity" in articles on liquids. Will you please explain the meaning of this term?—Sam Cohen, Bayside, L. I.

A great many people have difficulty in understanding the meaning of this term. It means the ratio of the weight of an equal quantity of water to that of another liquid. For example:—the weight of a bottle of a certain liquid is noted. The bottle is emptied and filled with water and its weight noted. Dividing the weight of the selected liquid by the weight of the water, the specific gravity of that liquid is obtained.

LUSTER PASTE FOR PLATE GLASS

Can you supply me with a formula for making a luster paste suitable for use on plate glass? Is it expensive to make?—Thomas Henshaw, Troy, N. Y.

The following formula for a plate glass luster paste is economical to make. Take five parts of finely washed and pulverized chalk; five parts of bolus, powdered; five parts of English red, powdered; five parts of wood ashes, powdered, and five parts of soap powder. Work all together to make a smooth, even paste, adding alcohol. The consistency of the paste can be governed by the amount of alcohol used.

CLEANING PEWTER WARE

Please inform me as to some method of cleaning pewter ware. I have been unable to locate any commercial preparations at local shops.—Jack Evans, Kingston, N. Y.

Pour hot lye of wood ashes upon the tin, throw on some sand, and rub with a woolen rag until all particles of dirt have been dissolved. For polishing after cleaning, make a paste of whiting and brandy, rubbing the dishes until the mass becomes dry.

STRIPPING GILT ARTICLES

Is there any easy way to strip gilt articles without damaging them? I will be very grateful if you can help me in this matter.—Reuben Wallace, Detroit, Michigan.

Stripping gilt articles is easily accomplished by attaching the object to the positive pole of a battery and immersing it in a solution composed of one pound of cyanide dissolved in one gallon of water.

PASTING LABELS ON TIN

I am having trouble keeping labels on tin cans. Can you inform me how to make a paste that will stick to the surface of cans?—John O'Brien, Glenville, Conn.

Labels separate from tin because the paste becomes too dry. Here is a satisfactory formula for a paste that serves well under average conditions of temperature.

Dextrine	2 parts
Acetic Acid	1 part
Water	5 parts
Alcohol, 95%	1 part

Dissolve the dextrine and acetic acid in water by heating together in the water. Add the alcohol to the warm solution.

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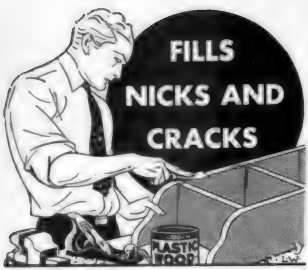

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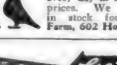

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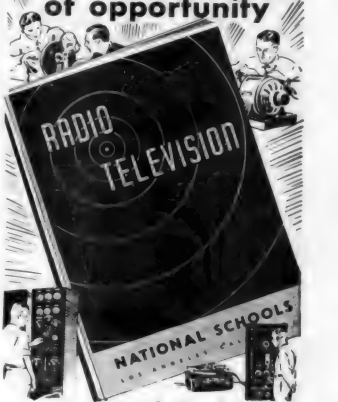

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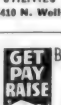

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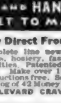

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The famous Midwest factory-to-you plan, proven by 18 years of success, is just as exciting. It enables you to buy at wholesale prices — to save up to 50% — to make your radio dollar go twice as far — to enjoy 30 days FREE trial in your own home—to pay as little as 50c a week.

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Volume XVIII
Number 6

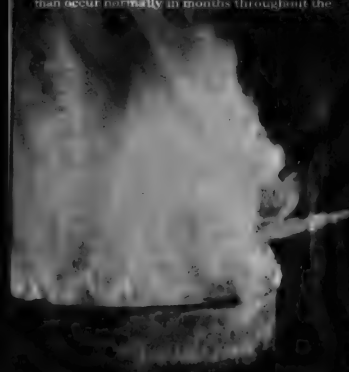
MODERN MECHANIX

OCTOBER
1937

WHERE PLAYING WITH FIRE PAYS

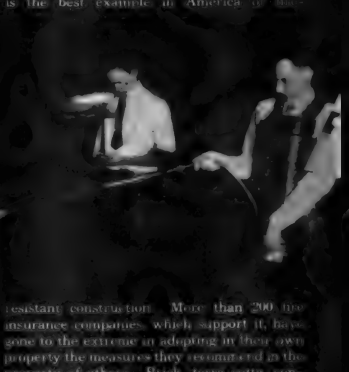
IN ALL the world, there is only one place where playing with fire has been made a paying proposition.

In the vast, rambling structure which houses the activities of the Underwriters' Laboratories in Chicago, more fires may be deliberately started every day of the year than occur normally in months throughout the rest of that big city. And yet, Chicago firemen never have to answer alarms from the Underwriters' Laboratories, nor does the state's attorney ever lodge charges of arson against the would-be "incendiaries."



Blessed by the benediction of work done for the sake of science, fiendish forces rage unhampered in this unique establishment. Temperatures are employed ranging from 2,300° above zero to 60° below. Pressure loads reaching 550,000 pounds are brought into action. Electric currents up to 100,000 volts, gases, chemicals and other agencies of destruction play their part while high-powered explosives perform in an abandoned quarry outside the city. The one object of it all is to determine exactly the life, fire and collision hazards of devices contrived for the service of man in a machine age.

This huge humanitarian service station, embracing 100,000 square feet of floor space, is the best example in America of fire-resistant construction. More than 200 fire insurance companies, which support it, have gone to the extreme in adopting in their own property the measures they recommend in the property of others. Brick, terra cotta, concrete, stone, steel and iron are used exclusively in the structural features and no wood or combustible materials can be found in any portion of the finish. No wonder Chicago firemen do not worry. But let's look around and see what is done here.



In 1926, when Admiral Richard E. Byrd made his historic flight over the North Pole, there hung in the pilot's cage of his plane a hand fire extinguisher bearing a plate with the words, "Underwriters' Laboratories Inspected." Again in 1928, when he flew over the South Pole and a third time during his latest trip to Little America, similar extinguishers were relied on for the protection they

by H. H. Slawson

give. You may have one like it in your car, or hanging near the furnace in the basement. When Byrd bought his and when you bought yours, the salesman said it would put out an incipient fire in a specified time. But will it?

For the answer, come and watch the test of a foam extinguisher in the "Tower Room" here. Built on the order of a lofty chimney to create a draft, the brick walls of this chamber are grimy with the smoke of uncounted conflagrations. Standing in the center of the floor is an iron tank, four feet in diameter, partly filled with water. Upon its surface, a deep film of gasoline is poured and standing back at a fixed distance is an attendant, holding the fire extinguisher which is under scrutiny. Close by is another man with a stop watch and a third waits with pencil and note book ready. At a signal, a fourth man tosses a lighted match into the cauldron.

The extinguisher is inverted and a smothering stream of chemical foam is sprayed on the flaming oil. If it works right, it has to be all over in 60 seconds and test after test is made to prove this possible. Otherwise, the investigators must determine what is wrong and recommend changes. The chemical mixture may be incorrect or the shape of the nozzle, the gas pressure or a dozen other details wrong. In the Underwriters' Laboratories, however, the job is never done until your fire extinguisher puts out a fire in one minute. The label then placed on the apparatus certifies to that fact.

Testing a fire window glazed with wired glass is another exciting matter. Looking up into the dim heights of a room suggestive of the flies back stage at grand opera, one sees a travelling crane. From it is suspended a frame made of steel girders, such as go into a modern skyscraper or factory wall. This frame swings free from the floor and within it, the fire window is set and bricked up exactly as it would be built into a structure.

When all is ready, the crane swings this ponderous load over in front of a "panel furnace" built of brick, on the floor nearby, but from surrounding walls. Through this thin rampart project scores of gas jets controlled by valves in the rear and with an arrangement for pumping air through at the base. The two segments of wall, looking like slices of a gigantic sandwich, are cemented together, airtight, and the gas ignited to produce what the laboratory folks call a

The mechanical robot which produces six motions of the human hand for endurance tests of electrical switches. If the switches stand up under this test, they are approved.

Right—Trying to defeat a bank vault alarm. The investigator is drilling a hole to determine if wires can be reached and disconnected. Services such as this saves the public thousands of dollars each year.

"standard fire." For forty-five minutes, the "lurid flames" of this made-to-order inferno lick at that fire window. Then a stream of water under 35 pounds pressure is trained on the cherry-red glass from a distance of twenty feet and when things cool off, examination shows if the window can take it.

Appliances for fire protection are not, however, the only concern of the laboratory technicians. Automotive and safety appliances, burglary protective appliances, those concerned in the gas and oil industry, electrical devices and others, covering more than 1,300 varieties and classifications of systems and products, come within the range of the laboratories' interests. Examination at Chicago is supplemented by close supervision of factory production, to see that manufacturers enforce rulings. Lately, a further step was taken to guarantee this compliance, when two motor trucks equipped as travelling laboratories were started out to make field tests and acquaint electrical jobbers and dealers as well as electrical inspectors, with the institution's work.

When electricity was still in its "romper age," long before Edison produced the incandescent lamp, the potential hazard of this "servant of mankind" was recognized by insurance men; one of the largest departments of the Laboratories is concerned with electrical devices. Every development in the electrical industry has been closely watched, the latest being in connection with the fast-growing air conditioning business.

In an effort to determine how electrical apparatus will stand up under the most severe conditions of abnormal use, it is submitted to unusually tough tests. For this purpose, equipment is used capable of delivering currents of 100,000 volts, the tests being made on such high tension apparatus as the transformer of an electrically ignited oil burner operating on from 10,000 to 12,000 volts: or transformers for gas tube signs using as high as 15,000 volts. If the appliance can

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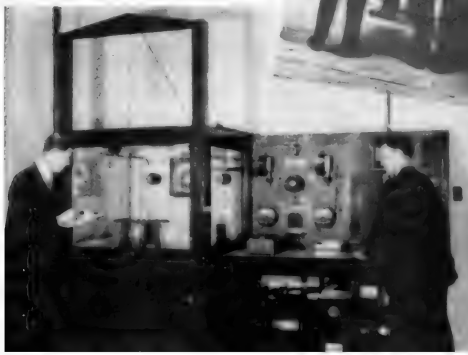


Above—A made-to-order "standard fire" is used to test the qualities of a fire window. The window is subjected to extreme heat and water under a 35-pound pressure.

Left—High tension electrical apparatus is used to test new equipment. Voltages ranging in value up to 100,000 are impressed on appliances to determine their breakdown points. —*Photos courtesy Underwriters' Laboratories.*

Seaplane Makes Non-Stop Transcontinental Flight

Flying from California to N. Y. City non-stop, this huge Consolidated PBY-1 flying boat is credited with having made the first transcontinental flight attempted by a plane equipped solely for water landings. Pontoons fold up to make wing tips.

A HUGE Consolidated PBY-1 flying boat has successfully completed a non-stop transcontinental flight from California to New York City, making its mooring on the waters adjacent to North Beach Airport. It is the first flight of its kind ever made by a plane fitted solely for water landings.

Although privately owned, the huge seaplane is of a type used by the U. S. Navy as a patrol plane. One of the outstanding features of the PBY-1 is the arrangement whereby the pontoons retract to become the wing tips when the plane is in flight.

Model Steam Roller Works

WEIGHING twenty pounds and operating on steam pressure of four pounds, a model steam roller has been constructed by H. L. Woodson, of St. Louis, Mo. A small gasoline stove is attached to the bottom of the steam roller and one-half pint of fuel operates the model for 35 minutes. The body is made of angle iron, the skirtings and apron of sheet metal, while the rollers are made of lead-coated sheet metal.

Generating power enough to climb a 30-degree grade, this model steam roller was built by H. L. Woodson, of St. Louis, Mo. A gasoline stove heats boiler, creating steam pressure of 4 pounds within engine's brass tubing cylinders.

Scientists Seek Pure Iron

IN THEIR search for an absolutely pure iron, scientists at the National Bureau of Standards in Washington, D. C., have prepared iron oxide that is free from even spectroscopic traces of 46 elements and with very small traces of silicon, aluminum, calcium, magnesium and copper.

Considered to be the most important metal in our civilization, iron has not yet been prepared completely free from all impurities or even as high a state of purity as has been attained for gold, platinum, zinc or aluminum and other metals.

U. S. Army Builds Trailer For Use As Field Office

IN LINE with its mechanization program, the U. S. Army has developed a special type trailer for use as a "command post" for officers. Pulled by a section wagon that carries extra supplies and equipment, the new trailer features sleeping quarters for four men, a desk with telephone connections, and fully screened doors and windows. The military trailer is about 12 feet long, 10 feet wide, and 10 feet high. A sloping, canvas-covered roof can be opened to let in air and sunlight.

Specially designed and equipped to serve as a field office for officers, this military trailer was recently demonstrated at Governor's Island, N. Y. Canvas roof covering can be unfurled.

Key Exhibit Worth Fortune

This collection of historical locks and keys is valued at a half million dollars. Some of the keys were once among the prized possessions of former Emperor Franz Joseph of Austria.

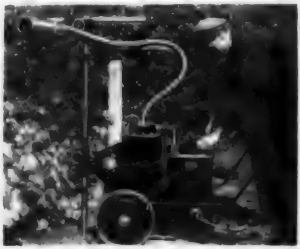
VALUED at a half-million dollars, a collection of historical keys and locks has been brought to the United States by Charles Courtney, international authority on the subject. The collection includes keys from the Rothschild collection unearthed from the ruins of Pompeii, and the personal collection of the late Andreas Dillinger, world famous collector of the Techniches Museum in Vienna, Austria.

Addresses of manufacturers of products mentioned in MODERN MECHANIX can be obtained by sending a stamped, self-addressed envelope to the editors.

Plants Treated With X-ray

SOVIET biologists and botanists are experimenting with Roentgen rays in the treatment of plants and flowers. Selected specimens are subjected to the rays through the use of a portable machine and the effects carefully noted and studied.

The portable machine features two "eyes" attached to flexible cables through which the electric current flows. The "eyes" are mounted on a telescopic support, enabling the rays to be trained on plants of varying size. The entire Roentgen unit is mounted on a two-wheeled carrier that is pushed along like a wheel barrow. A lengthy wire cable connects the x-ray machine with a power supply unit stationed nearby.



To test the effect of Roentgen rays on plants and flowers, Soviet biologists rigged up this portable unit. The unit's "eyes" are held above plants by means of a telescopic stand.

invisible rays set up BURGLAR BARRIER

HOW an intricate net of invisible electric rays can be used effectively to snare burglars and kidnapers, and bring down the law upon them without their being aware of it, has been demonstrated in New York City. The device was installed on the fourth floor of the General Electric Building, and various individuals were invited to test its powers of detection and alarm. Attempts to enter the 13,000-square-foot area or to move from one zone to another were defeated at every turn.

The protectional device relies principally on the phototube, or "electric eye," to foil marauders. The protective network was made up of the beam from a standard automobile headlight bulb, from which all visible rays of the light spectrum had been filtered. By a multiple system of mirrors, this single invisible beam was reflected back and forth across a room, around corners, and at different levels and angles until the guarded area was completely protected against movement of a body in any direction.

The system is extremely flexible in that the energy released by interfering with any beam can be used for various purposes, such as sounding an outside bell or siren. The type of installation made at the demonstration was unique and presaged more modern and effective methods. It automatically cleared a telephone line, dialed police headquarters, and transmitted a spoken message summoning aid. After this message had been repeated for a minute and a half, the device "hung up" and then called the telephone company, repeating its message for the same period as a check upon the first call. Having done this, it once more cleared the line and automatically placed the telephone back in

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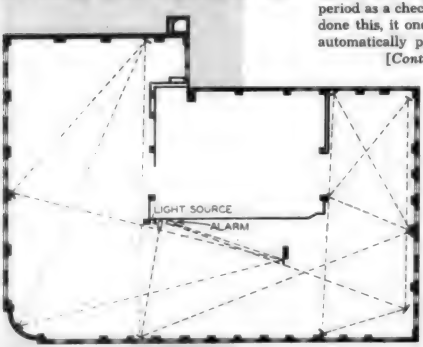


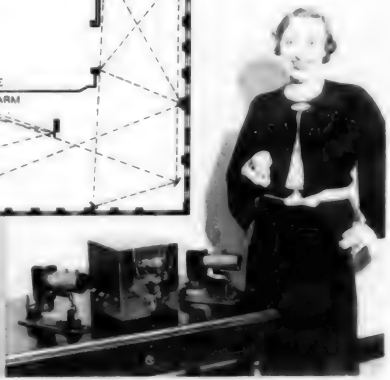


Diagram shows intricate net of invisible rays used to snare burglars there without their being aware of it. Breaking the ray at any point sets off the alarm. The device relies principally upon a photo tube or "electric eye." The protective network is made up of a beam from a standard auto headlight bulb with all visible rays eliminated by a filter. Photo shows the equipment used. The woman is holding one of the reflecting mirrors.

Aerial Tramway To Scale New Hampshire Peak

THE first aerial tramway in North America is being constructed up the side of Cannon Mountain in New Hampshire. Construction is expected to be completed about July 1, 1938, according to engineers' estimates.

The tramway will feature metal cars, octagonal in shape, which will carry 25 passengers each. Pulley-type trestles will support the cars as they travel along cables up the mountain side.

The tramway will start from the base of Cannon Mountain at Franconia, N. H., which is located about a mile and a quarter from the famous "Old Man Of The Mountain" known to millions of tourists.

North America's first aerial tramway is being constructed up the side of Cannon Mountain near Franconia, N. H. Artist's sketch shows the type of car and trestle to be used.

Spray Shield Protects Lens

To keep a camera lens clear of sea spray while filming ocean scenes, John Arnold, a motion picture studio chief cameraman, supervised development of a rotating disk and wiper device.

TO AID in taking spectacular sea scenes aboard a fishing schooner while racing through a heavy sea during the filming of the motion picture "Captain's Courageous," cameramen invented a spinning windshield to keep the spray off the camera lens.

The windshield consists of a seven-inch plate glass disk mounted on a pulley attachment between the lens and lens shade. The disk rotates at 240 r.p.m., while a stationary wiper keeps one section continually clear.

Hammock Has Tubular Stand

A MODERN version of the comfortable old-fashioned hammock, which possesses its advantages while discarding its disadvantages, has recently appeared on the market. Featuring a tubular metal support, the new hammock can be folded to make a compact package for easy transportation.

Four sections of heavy gauge tubular steel form the stand for the hammock. Quickly assembled, the stand efficiently supports the hammock of heavy double-filled canvas. Corded ropes, nickel rings, and reinforced eyelets complete the attractive hammock.

Comfortable and strongly constructed, this modern hammock has a folding tubular metal stand. Easily disassembled, the hammock makes a compact bundle that is easy to transport.

Odd Jobs

by
Paul D. Paddock

Preparing for small blasts of dynamite which will cut away rock during the sculpturing of one of the heads on Mount Rushmore, in South Dakota. A fraction of an ounce of powder is used at a time.

AMERICAN industry employs many kinds of helpers, but one of the most efficient and versatile of all is "Old Man Dynamite," champion lifter and odd jobs expert.

More than 500,000,000 pounds of explosives are used annually in this country alone in a varied program of peace-time performances. The deeds of dynamite range all the way from carving mountains to killing crows, from dropping prefabricated dams into place and hunting for oil to killing rattlesnakes and putting out oil well fires. No human worker can boast such a list of accomplishments.

Even in routine blasting in mines and quarries improved technique and new kinds of dynamite are being introduced and recently perfected non-freezing dynamite has extended the "old man's" working days so that tasks all but impossible for human hands are now being done in all seasons with dynamite's power and remarkable versatility.

Up in Maine recently, dynamite was assigned to a new job and did it so well that experts see a whole new field of winter-time service from the explosive.

Dynamite has been used successfully for blasting ditches in hard, frozen ground. Curiously enough, explosives experts found that less dynamite is required to displace frozen earth than is necessary to blast wet ground or dry soil. This was held due to the fact that the hard frozen ground confined the exploding dynamite's expanding gases better than loose ground and there was a greater shattering effect because of less "cushioning," as often occurs in soggy ground. The blasts blew a ditch eight feet wide at the surface, three feet deep and two feet wide at the bottom. The hardest part of the job, the workers said, was in clearing up the large pieces of earth and in boring the holes in the ground for the sticks of dynamite. This new job, made possible largely by non-freezing dynamite, holds great possibilities for winter-time activity on farms and elsewhere.

Scores of ice jams will be broken up this

For Dynamite

Above — Blasting a gully bank with granular dynamite to obtain top soil for planting trees and bushes in the gully. Right—After the blast. Below (left)—Mount Rushmore Memorial with the head of Washington nearly completed. The white portions show where dynamite was used for removing rock.

winter and lives and property saved by dynamite. This is one of the routine jobs on the schedule, but one of the strangest winter-time tasks of the explosive is performed in a section of west Texas where rattlesnakes menace the sheep and goat herds.

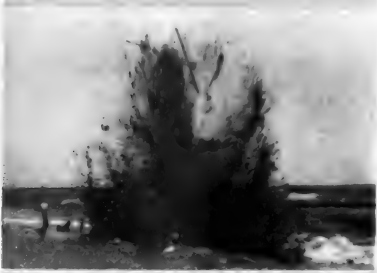
When cold weather drives the snakes into their dens for the winter, the dynamite squads get busy. The snakes' hiding places are located, charges of dynamite exploded and the rattlers blown out. Those not killed by the blasts are put to death in other ways. The method has proved effective for large-scale extermination of the pests.

Maruding crows are killed with dynamite in certain sections of the country, a particularly successful use of the explosive for this purpose having been applied recently in Illinois. The birds' roosting places in trees and hedges are located, bombs set and wired together to be fired by electricity simultaneously and hundreds of the crows killed by the explosions.

Top of page—Relief blasts and charges under the fill all going off at the same time. Note height to which dirt and stone are blown by relief blasts.

The recent destruction of "Honeymoon Rock" at Niagara Falls by a charge of dynamite and black powder attracted wide attention chiefly because of the public's sentimental

Preparing to remove piling by dynamite. A water jet is used to displace sand, and as the hole alongside the piling is made, dynamite attached to a pole is pushed down into the cavity.



Charges of dynamite in the sand alongside the piling are shot in series by the electrical method of setting off blasts, thus cutting off a number of piles at one time.

When it was necessary to remove a massive reinforced counterweight from a marine crane, dynamite was used. A camera caught the actual blast. The steel work was not damaged.
—*Photos Courtesy E. I. du Pont de Nemours & Co.*

interest in the rock, not because of the unusual nature of the blast. In felling the west tower of the Century of Progress Skyride in Chicago, dynamite was used in a brilliant demonstration of the accuracy with which explosives experts are able to accomplish ticklish tasks with the aid of the "odd jobs man," but an assignment which includes both the spectacular and the routine is the carving of the Mount Rushmore memorial in the Black Hills.

Colossal likenesses of Washington, Jefferson, Lincoln and Theodore Roosevelt are being carved into the granite side of the 7,000-foot peak and here dynamite "turns sculptor" under the direction of skilled human hands.

Tiny blasts with as little as one sixty-fourth of a pound of special gelatine dynamite have been touched off to do much of the intricate sculpturing. In some cases, only the electrically detonated blasting caps were used.

Holes of varying depth and diameter are drilled and the charges are figured with as much precision as an assayer of rare minerals employs in his work. In carving out the head of Washington, about 6,000 pounds of dynamite and 40,000 blasting caps were used. Gutzon Borglum, chief sculptor of the huge memorial, is said to be the first artist to use dynamite in this way.

Midget blasts are all right in some of the work at Mount Rushmore, but when "Old Man Dynamite" goes prospecting for oil, he lets go with charges varying from fifty to 2,000 pounds per shot. He becomes literally an earthquake-maker and sometimes registers shocks a mile deep in the ground and ten miles distant from the point at the surface where the charge is fired.

The task of hunting for oil with dynamite is somewhat complicated, but in a nutshell here is what is done. The tremors and other phenomena set up by the exploding dynamite are registered and measured upon delicate instruments. By careful study of these records, scientists are able to

[*Continued on page 147*]

FLOATING SEAPLANE BASE TESTED

THE "Friesenland," a floating seaplane base and largest of four to be stationed soon along the lane of the proposed German North Atlantic flying service, recently passed tests to determine its efficiency for handling the large flying boats that will be flown on the route. The ship is equipped with a huge crane that is used to hoist the seaplanes from the water for servicing and refueling.

The Lufthansa, a German airplane company, will operate the seaplane flying service. Use of the floating bases will enable the German firm to use comparatively smaller seaplanes than those being used by American and British airplane firms for crossing the ocean non-stop.

When Germany inaugurates a North Atlantic flying service, the "Friesenland" (top) will serve as the largest of four floating servicing and refueling bases. Lower—A seaplane taxiing into position preparatory to being hoisted aboard for service.

Low-Cost Sextant Produced

Small boat owners, sea scouts, etc., can indulge in a practical study of navigation through use of this new low-cost sextant. Its vernier reads accurately to a twentieth of a degree.

BOAT owners who desire to practise "shooting the sun" to enhance their knowledge of navigation can now do so at a very small cost through the production of a small sextant by a Bronxville, N. Y., manufacturer. Priced at $3.50, the device is complete with an artificial horizon and a vernier that reads to a twentieth of a degree.

Builds Ancient Arms Models

BUILDING scale models of ancient war weapons is the fascinating hobby of Jerome D. Laudermilk, a research associate at Pomona (Calif.) College. His miniature ancient arsenal includes such weapons as a Greek polybolo, forerunner of the machine gun; an elephantine cross-bow; a Roman Onager and many other odd weapons.

This arsenal of miniature ancient war weapons is the proud possession of Jerome D. Laudermilk. The working scale models hurl their stones, bows, etc., accurately for 100 yards.

DOUGLAS—

by Robert H. Rankin

HIS name is Donald Willis Douglas. Sixteen years ago he was working as an engineer for Glenn Martin, builder of the now famous Martin bombers. Today, as head of his own firm, he is rated one of the world's foremost designers and constructors. In July, 1936, President Roosevelt officially awarded him the Collier Trophy for 1935 in recognition of his outstanding work in the development of twin-engined commercial transport planes.

Douglas was born on April 6, 1892, in Brooklyn, N. Y., and as a youth attended the Trinity Chapel School in New York City. In 1909, having successfully passed the difficult entrance examinations in good style, he entered the United States Naval Academy at Annapolis.

For three years everything went along quite well for young Douglas and it seemed certain that another year would see him commissioned in the U. S. Navy. However, he was very much interested in aviation, even at that early date, and spent all the time he could spare from study and training in building model airplanes. One day, he climbed to the second story of a barrack and launched a model into the air. Fate so ordained that the little craft swooped earthward, knocking off the hat of an admiral who was passing by at the time. Evidently, the old sea dog wasn't very air-minded, for within a short time Douglas resigned from the Naval Academy.

The young man was determined, however, to secure a good engineering education, so he immediately entered the Massachusetts Institute of Technology, and was graduated in 1914 with a Bachelor of Science degree. The following year, he joined the engineering staff of the Glenn L. Martin Company and was made chief engineer of the little shop in Los Angeles, which was the only plant the Martin organization boasted of at that time.

In 1916, Douglas resigned his position to become a civilian aeronautical engineer with the U. S. Army Signal Corps. In 1918, he rejoined the Martin organization, this time being made chief engineer of the large plant which Glenn Martin had developed at Cleveland, Ohio. During this time, he assisted in the designing and building of the first twin-motored Martin Bomber. This equal-span biplane was the first practical multi-motored bombing plane developed in this country. Powered with two 400 h.p. Liberty engines, this bomber was a standard service bombardment craft for many years.

In 1920, Douglas again left Martin and after spending a short time in the East decided to go to the Pacific Coast in the hope of

Powered by two engines of 1,000 h.p. each, the Douglas DF flying boat shown above carries 32 passengers non-stop for 1,500 miles at a top speed of 189 m.p.h. Left—Douglas O-43A observation planes are standard Air Corps equipment. Right—Donald Willis Douglas, noted designer.

finding enough capital to enable him to establish his own aircraft factory.

He arrived in Los Angeles with limited funds, but within a comparatively short time was able to interest a Mr. David Davis in his plans. Believing that the day of commercial avia-

builder of super planes

One of the most popular types of transport planes ever produced is the Douglas DC-2 (top), being used by leading American and foreign airlines. A DC-4, four-engined type is scheduled for production during 1937. Center—Carrying a torpedo underslung beneath its fuselage, the T2D twin engined seaplane earned large Naval contracts for Douglas. Lower photo—Designed primarily for commercial markets, the Dolphin became a military "best seller".

tion was dawning, Douglas was of the opinion that if the American public was stirred by a non-stop transcontinental flight, commercial air transportation would receive a more ready welcome. The Davis-Douglas Company was formed and a small shop was leased from the Goodyear concern. In this little plant, the first Douglas ship, the Cloudster, was built. Designed especially for the transcontinental hop, this Liberty powered craft was the first American-built airplane which could get off the ground with a useful load equal to its own weight.

On its attempted non-stop flight across the country, the Cloudster was forced down at El Paso, Texas, by engine failure. Mr. Davis withdrew from the concern and the Davis-Douglas Company passed out of existence.

In the meantime, Douglas attracted the favorable attention of several influential men and in 1921, when the Navy announced an open competition for torpedo plane designs, he was able to raise some $15,000. With this sum he set to work, and designed and built the craft which won the competition.

This marked the real beginning of the present Douglas organization, for the Navy immediately ordered two of the ships. The following year eighteen more were delivered to the Navy.

As a result of the success of the Douglas torpedo plane, the "D. T.," an improved model was brought out. This twin-float, Liberty-powered biplane was delivered to the Navy in quantity and many of them were also

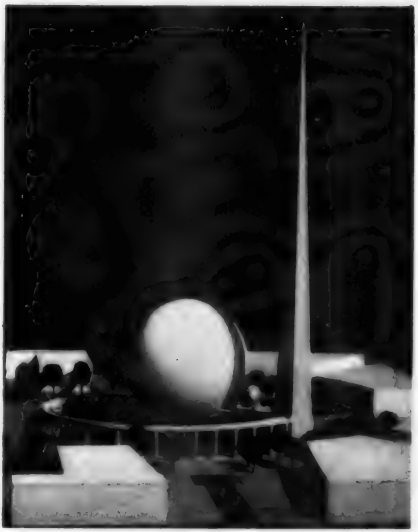
[Continued on page 143]

New York World's Fair Holds Appeal for Hobbyists

TO DEVELOP the creative talents of amateurs, the Hobby Guild of America has inaugurated a series of contests, the prizes being trips to the New York World's Fair in 1939. Known as the World's Fair Hobby Olympics, the contests have been designed to include all work along artistic, creative and self-expressive lines. The scope of the contest has therefore been made extensive and inclusive.

Competitions will be held in the field of short stories, essays, poetry, drama, music, sculpture, marquetry pictures, photography, graphic art, painting, model making, needlecraft, leatherwork, metalcraft, puzzles and culinary art.

The winner of each contest will receive a trip to the World's Fair. The trips will include hotel accommodations, trophies and entrance to the fair grounds. Seventy-five trophies will be awarded to the next five winners in each contest, and books valued at more than $500 will go to contestants winning honorable mention. Awards will be made on the basis of originality, execution and artistic merit. The contests are open to amateurs only.



Model of the 200-foot sphere which will house the Theme Exhibit at the New York World's Fair in 1939. From the 700-foot triangular tower, broadcasts will be made to all parts of Fair grounds. Engineers are working on long-range sound projectors.

The judges for the Olympics include leaders and outstanding individuals of many fields of activity. They are: Drama, John Anderson, Crosby Gaige, Clayton Hamilton, Mary Hutchinson, George Poultney, George Ross, Howard H. Seiter and Lowell Thomas; Short Story, J. Donald Adams, Whit Burnett, Edwin C. Hill; Essay, Cyril Clemens, Dr. Isaac Goldberg, and Carolyn Marx; Poetry, Major Augustus Post; Music, Frederick J. Halton, Leonard Liebling, Dr. Sigmund Spaeth and Paul Whiteman.

Needlework, Kay Austin, Rose Bampton, Kay Daniels, Lily Pons, Edith Marie Reuss and Helen Worth; Culinary Art, Mrs. Dorothy Dunbar Bromley, Crosby Gaige, Lauritz Melchior, Mme. Elizabeth Rethberg; Photography, Berenice Abbott, Dr. Arnold Genthe, Nicholas Haz; Model Making, Ezio Pinza, and Mario Chamlee; Puzzles, Joseph L. Andrews, Jerome S. Meyer, David Shulman; Metalcraft, Marion Cole; Painting, John Sloan; Leatherwork, Emanuele Stieri; Sculpture, Katherine Hahn and Frederic Allen Williams.

Among the more unusual hobbies noted by the Hobby Guild are those of collecting knotholes, branding irons, odd shaped and colored tooth picks, book dedications and canned goods.

One hobbyist has collected enough newspapers of important events to build a house of them. The walls have a width equivalent to the thickness of 215 pages.

STUNT FLYING—

FIG. 5 - SUCCESSIVE STAGES

FIG. 1 - THE CLIMBING LOOP (SLOW LOOP EXECUTED SIMILARLY) AND, INSET (FIG. 3) THE UPWARD ROLL OR SPIN

FIG. 2 - THE TAIL SPIN OR SPINNING NOSE DIVE

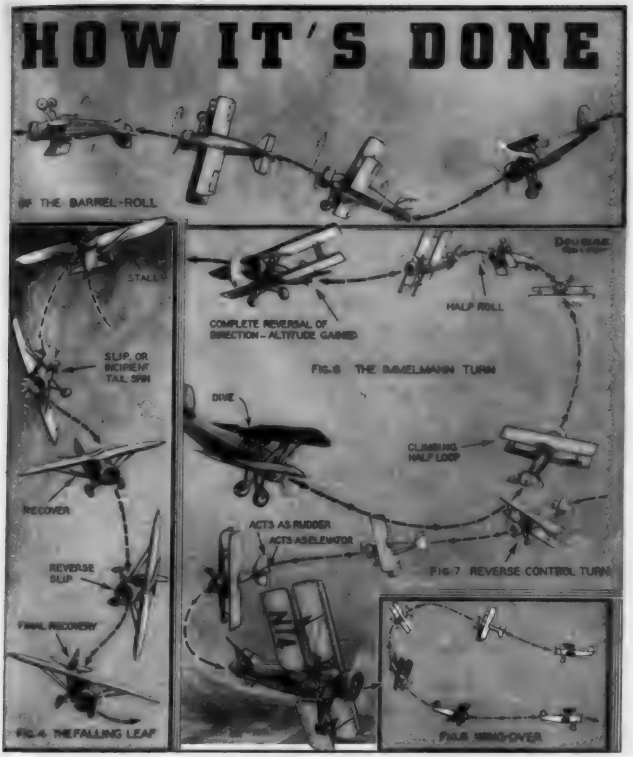
AEROBATICS never fail to attract attention at fairs, air meets, etc., but few laymen actually understand the evolutions executed by stunt pilots as sketched above.

Figure 1: Climbing Loop—performed by diving plane, pulling back on control stick, easing throttle at top of loop, and returning to normal position through dive.

Figure 2: Tail Spin—plane rotates flatly about its center of gravity. Performed by placing plane in a stall by pulling control stick all the way back and applying full rudder to right or left. Recovery is made by neutralizing controls or use of counter rudder.

Figure 3: Upward Spin—a slow roll executed as plane climbs vertically. Performed by diving to gain speed, pulling back on stick until plane "stands" on its tail and rolling through use of the aileron controls.

Figure 4: Falling Leaf—plane is pulled up into a stall and tipped to one side by means of ailerons. Immediately, ailerons and rudder



are applied in opposite direction until plane responds by swinging to side against which controls are held. Controls are then swung to opposite side and procedure repeated.

Figure 5: Barrel Roll—plane is dived to gain speed and then climbed slightly while applying rudder and aileron in direction of desired roll.

Figure 6: Immelmann Turn—originated by the famous German War ace as a combat maneuver for making quick change of direction while gaining altitude. Plane is dived, control stick pulled back until plane is on its back, upon which control stick is pulled back and full rudder applied to perform a half roll.

Figure 7: Reverse Control Turn—plane is banked at right angles to ground, whereupon controls become reversed, the rudder acting as elevator and elevator as rudder.

Figure 8: Wing Over—nose of plane is pulled up and bank started, rudder then being applied.

Clambake Steamer Trailer Serves 100,000 Clams

Featuring perforated trays set in tiers over a built-in steamer, this traveling clambake trailer (top) carries about 100,000 clams. Lower photo — Unmounted cab, showing trays.

A TRAVELING clambake steamer trailer capable of carrying 100,000 clams, enough for 2,000 persons, or other foodstuffs in quantities sufficient to serve 500 people, has been devised by Fritz Kiefer, a Raritan, N. J., restaurant proprietor. Of galvanized iron construction, the cab of the trailer has more than 900 feet of shelf space distributed in four sections of 12 perforated and horizontally tiered trays of special design.

A water tank from which steam is caused to rise and percolate up through the tiers of trays is located at the bottom of the trailer. More than 400 gallons of water and half a cord of wood are required to cook a capacity load of foodstuffs. The cab containing the trays can be removed from the trailer chassis.

"Lifeguard" Tubes Devised

DESIGNED to eliminate the danger caused by blowouts, a "lifeguard" auto tire tube has been developed by a leading rubber manufacturer. Tests using nails, spikes, glass, etc., are said to have proved the practicability of the tube.

The tube actually consists of an arrangement of a tube within a tube, joined together at the base with a single vent hole connecting the two air chambers. In event of a puncture of the outer tube, the tire merely drops about one inch and then rides on the smaller inner tube while driver makes safe stop.

When the tires of this auto are punctured they merely drop about one inch and ride on a specially constructed tube set within the inner tube, enabling driver to make safe stop.

Soviet Tots Try Parachutes

Sliding down the chute of this specially constructed playground tower while slung beneath an opened parachute provides thrills for Soviet youngsters. Tower is 14 foot high.

AIR-MINDED Soviet children are provided with the thrills of parachute jumping through use of special towers erected in many city parks. Equipped with small parachutes, the youngsters slide down a chute atop the 14-foot towers and settle slowly to the ground. Metal guide rings keep the parachutes open.

Left—A Burbot and what has been found to contain "liquid gold," a new liver oil rich in vitamins A and D. In the container at the left is the liver from the fish. The other container contains the yield of "liquid gold." Below—T. H. Rowell in his laboratory, where he discovered the "liquid gold."

Cannibal Fish Yield "Liquid Gold"

FISH so cannabalistic that they eat their own spawn if hungry enough have been found by science to contain "liquid gold"—a new liver oil extremely rich in vitamins A and D.

T. H. Rowell of Baudette, Minnesota, a former chemistry student at the University of Minnesota, discovered this oil after several years of biological experiments and tests, thus turning a destructive fish into a source of benefit to humanity.

These cannibal fish, known by their proper name as Burbot fish, live in large quantities in the Lake of the Woods in Northern Minnesota, on the United States-Canadian boundary. For many years commercial fishing has been carried on here on a large scale. However, within recent years the cannibal fish increased in such quantities that for a time it appeared that the fishing industry would be wiped out completely. As these cannibal fish had no value whatsoever, the commercial fishermen were on the verge of despair until Mr. Rowell made his discovery proving them of value. Now, since they are worth real money, they are sent to the Rowell Laboratories.

These cannibal fish are large, often weighing ten pounds or more, and even though they have no commercial value, people who have tried them say that they are fairly good eating. Their heavy-walled stomachs are often found to hold a pike two-thirds their own size. From one stomach alone as many as two hundred yearling perch have been removed.

Since the discovery that the Burbots contain oil of value, approximately a half a million of them have been taken from the nets

[Continued on page 130]

How

by
Donald G.
Cooley

This display in a New York store window is so realistic that passers-by instinctively reach out to touch it—only to find an "invisible window" in their way. This idea brought its inventor a fortune.

YOU thought all glass was invisible? Wrong. Go to the foot of the class.

Take a look at a plate glass display window the next time you pass a large department store. Observe street traffic and passers-by reflected in the glass. If the light strikes at the right angle the glass, far from being transparent, becomes a mirror efficient enough to enable you to adjust your tie or powder your nose from your reflected image.

A young Londoner named Gerald Brown took note of these obvious facts, realized that hundreds of thousands of dollars worth of window displays were handicapped, and invented an invisible glass window which gives the shopper the sensation that he can actually reach out and touch the articles on display. In the case of diamond necklaces, this is a beguiling illusion.

Mr. Brown achieved the desired invisibility by using curved clear glass, black glass reflectors and mirrors. These invisible windows have been installed in many fashionable stores in New York and they are beginning to appear in shops throughout the country. Thus far the patent for this extremely simple invention has paid its inventor $70,000 for American, $30,000 for Canadian rights.

Interesting though the invention is from a technical point of view, the story of how it was promoted and sold is of even greater interest to any inventor who has ever taken out a patent, or hopes to do so. It holds a fine object lesson for any man with an invention to commercialize.

The man who introduced invisible glass to this country was Harry H. Stockfeld, an agent of the inventor. Mr. Stockfeld pioneered in bringing shatter-proof glass to the automobile industry. He also introduced the American Austin automobile and dozens of other noteworthy inventions. His common sense, practical methods of turning patents into cash reveal how inventions can be sold to Big Business in this modern age of efficiency and competition.

"Too many inventors," says Mr. Stockfeld, "go to a manufacturer and try to sell him their invention with nothing to show but patent papers. The invention should first be sold on its merits as a product to a customer who sees its usefulness in his business. Then, with a contract to purchase one or a dozen or a hundred of the devices in your pocket, it is time enough to seek a manufacturer. With a market assured for the product, selling the manufacturer is an easy matter."

The commercial history of invisible glass is a perfect illustration of how this system works. Mr. Stockfeld first went to an automobile manufacturer and demonstrated that a window of invisible glass in his expensive New York display room could be made to sell automobiles—attracting thousands of prospective buyers who could study a car on display exactly as if there were no sheet of glass between it and the street. He came away with a $50,000 contract in his pocket. Then, and not until then, did he approach a glass manufacturer. With the contract

to Sell Inventions

The inventor of the "invisible window" sold his invention readily after he first showed an responsible manufacturer how effective the idea could be. There is glass in this display window, but it has no disturbing reflections.

offering convincing proof, the selling job was easy.

"Go to the president or directing head of the corporation you are trying to sell," Mr. Stockfeld advises. "An inventor usually is merely wasting his time when he deals with minor executives who do not have full authority to make decisions."

But, once having gained an audience with a man in authority, how should the inventor proceed in selling a patent? This depends somewhat on the nature of the

Below—A baseball striking the new glass will cause cracks, but the glass retains it shape. Right—A football player striking full force against a pane does no more harm than to cause several cracks. After glass is broken it may be rolled up like a carpet. Demonstrations like these are very effective in selling an idea or invention.

Stretching like a rubber band, this newly developed safety glass will withstand the impact of a man jumping on it. Although cracks appear, the glass retains its shape and danger of flying particles is eliminated.

Left—Examples of various types of laminated glass subjected to tests of an eleven-pound weight falling on it from different heights. Note that pieces have been broken out of the first three while fourth remains in one piece.

Right—The same types of glass shown above subjected to the falling ball test. Note that first three are broken apart while the one using the new plastic remains in one piece. A well-staged stunt of this kind is helpful in putting over a new invention.

invention. Every patent involves problems and possibilities all its own. Fundamentally, however, the buyer must be made to respond to the same motive which led the inventor to create his device in the first place—the profit urge. The inventor needs to prove but one of two things: either the invention will make money for the buyer, or will save him money.

Mr. Stockfeld advises the preparation of a prospectus which, in great detail, shows exactly how the invention will do just these things. The preparation of such a prospectus demands a full knowledge of the business involved, and an analytical approach. Facts and figures must be accurately presented, and all angles considered.

Suppose you were selling an invisible glass window. Analyzing the invention, your presentation of facts would run something like this: The present display window is designed to sell goods. It must bring in $50,000 worth of business a year, just to pay for itself, the expense of keeping it dressed and displays changed. The invisible glass window will cost $12,000. It attracts more window shoppers, brings more people into the store because of its novelty and the fact that, since there is no visible glass to shut off the customer from the display, there is an unconscious feeling that the customer is already inside the store. Because the window attracts so much attention, the high-salaried window dressers always put forth their best efforts to keep it attractive. In a rainstorm, invisible windows are not affected because of the curved glass and consequent setback from the street. And so on in complete detail.

High-pressure selling methods are unnecessary and usually work to the disadvantage of the inventor. If the product has merit, an intelligent presentation suffices and the prospect may be permitted to sell himself.

Some inventions lend themselves to selling by demonstration. In the case of a new super-strength steel in which Mr. Stockfeld was interested, he placed an automobile axle casing made of his steel alongside one taken

[*Continued on page* 146]

German Scientists Construct Huge "Atom Smasher"

IN THE unending battle to harness the energy within the atom scientists at the Emperor Wilhelm Institute in Berlin have constructed a mammoth machine designated as an "atom smasher." Experiments are being conducted under the direction of Professor Peter Debye, world famous physicist.

The gigantic "atom smasher" machine stands 50 feet high and is located within the confines of a windowless tower 135 feet high. A three-million volt electric current is used during the course of the experiments.

The wall of the tower features several observation platforms from which the scientists can make studies of the working of the apparatus. The high voltage accelerates particles passing through the vacuum tubes of the gigantic machine.

This 50-foot "atom smasher" is housed within a 135-foot tower in Berlin, Germany. It handles three million volts of electricity and scientists check its action from wall platforms.

Youth, 12, Solos Airplane

Inherent flying ability plus good teaching enabled Edward Somers, age 12, to solo a Fleet biplane at Floyd Bennett Airport, Brooklyn, N. Y., after less than 12 hours instruction.

AFTER receiving less than twelve hours of dual instruction, Edward Somers, age 12, of Brooklyn, N. Y., recently soloed a Fleet airplane at Floyd Bennett Field. The youthful aviator soloed the plane for 15 minutes before making a landing. Edward is the son of Representative Andrew L. Somers.

Life Jacket Features Light

A NEWLY developed life saving jacket features a light that automatically illuminates when the jacket contacts the water, making night rescues easier. Pieces of carbon and zinc are held in a container sewn into the jacket which is impregnated with salt. Upon contact with water, the wired jacket becomes a battery supplying current.

This man is demonstrating a new life saving jacket featuring a light that automatically illuminates when jacket contacts water. The light will operate continuously for 72 hours.

Friendship between a cat and a bird can be developed through proper training as explained in this article. This photo shows the author's tame cat and a pet mocking bird playing together. The bird can even pull the cat's whiskers without retaliation. Circle—An owl trained by the author. He flies away every night, but returns through an open window the following morning to secure his usual rare meat breakfast.

Wild Birds for

by Dick Cole

CANARIES are the common household bird, but any bird makes an interesting and affectionate pet if raised from a fledgeling. It is unlawful to "cage" some kinds of birds, but if a bird is free to come and go from its cage at will, it is not "caged." If the cage is made attractive to the bird, the bird will look upon it as a "home"—not as a place of confinement. When a bird assumes this attitude, the cage can be hung outdoors, and the bird will not fly far away.

Every year thousands of little, fluffy fledgelings are forced too early from their nests only to fall prey to a prowling cat. If one can rescue one of these little fellows, be it a sparrow or a lark, it can be raised as an interesting pet.

Care must be taken in feeding very young birds. The yolk of a very hard-boiled egg, varied with small pieces of tender raw beef, is a suitable diet for most baby birds. One drop of water from an eye-dropper should

Carrier pigeons are co[illegible] English sparrow that [illegible] by through the [illegible] delivering a message to any selected member of the [illegible] Lower circle—Closeup of "Twiller" with message. Bo[illegible] —One of "Twiller's" favorite imaginary dust baths on a newspaper. Bits of newspaper serve as "dust" for this [illegible]

be given at hour intervals during the day. *Don't over-feed the bird!* It does not expect to be fed every time it opens its big, yawning mouth. In the nest, every bird opens its mouth when the mother arrives with food, but she feeds them one at a time in regular turn. A small piece of beef or egg-yolk once an hour is ample for a young bird.

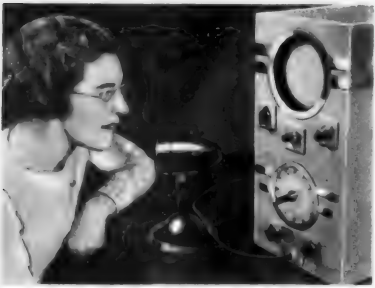
When the bird shows an inclination to move about, make it come to your hand to be fed, calling it by its pet name. If the bird won't come to you after a reasonable amount of coaxing, then let him go hungry for an hour or so. Ultimately it will come to your hand, and thereafter will come without hesitation. When the bird is ready for his first flight, let him get fairly hungry and coax him to fly to you to get his "eats." If a bird makes his first flight to you, it will grow up naturally tame and unafraid. Don't force any unwelcome attentions on the bird. Some birds resent having your hands around them. If you do this several times, the bird will cease to come to you.

Cater to the whims of the bird until you have gained its complete confidence. Birds are naturally playful and mischievous; their mischief can often be built up into amusing tricks. I found my pet mocking bird playing with a ping-pong ball; he would give it a

[*Continued on page* 124]

Household Pets

Resonoscope Provides Visual Image Of Tone Pitch



By singing into the microphone attached to this electronic resonoscope device, this singer can determine whether her voice is properly pitched. A cathode-ray tube provides visual images of wave forms of musical notes under observation.

AN ELECTRONIC device which checks a musical instrument or human voice, indicating its pitch and quality, has been produced in a Montclair, N. J., laboratory. Known as a resonoscope, it consists of a special cathode-ray oscillograph used in conjunction with a standard set of musical frequencies representing the twelve notes of the chromatic musical scale.

A voltage amplifier strengthens the musical tones picked up by means of a sensitive microphone, and the amplified output is placed on the vertical plates of the cathode-ray tube. This provides a visual image of the wave form of the musical note under observation. The speed with which the wave form moves across the screen, together with the direction of motion, indicates the extent to which the instrument or voice is off pitch.

Tractor Driven Like Horse

REINS, similar to those which are used to drive a team of horses, are employed to operate a "giddy-ap" tractor mechanism devised by Bond and Bert Bonham, of Clearfield, Utah. A combination of a multiple clutch and a differential gear box is the secret of the driving mechanism.

The tractor, which may be hitched to a cultivator, weed eradicator, or other farm machine, operates by simply pulling on the reins. A pull on the left rein causes the tractor to turn left, the right rein to make it turn right, while a pull on both reins causes the tractor to halt.

"Giddy-ap" says this youngster as he manipulates reins to drive his tractor like a team of horses. A special gear mechanism makes the tractor respond to driver's pull on reins.

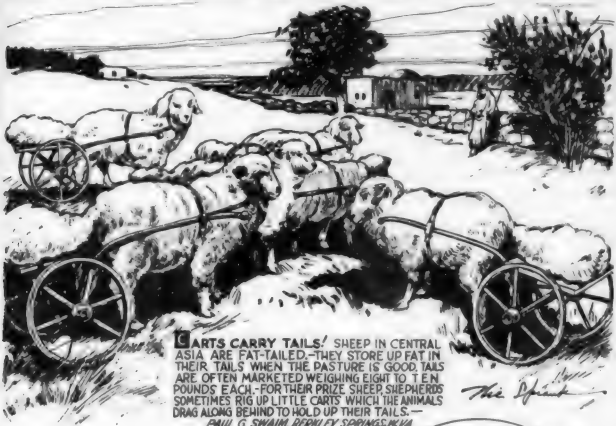
Bridge Has Grill Roadway

This worker is boising together a section of the fabricated steel grillwork that is being used as the roadway on the Marine Parkway Bridge connecting Brooklyn and Long Island.

DESIGNED for lightness without sacrificing strength, a new type roadway of fabricated steel grillwork is being used on the Marine Parkway Bridge that connects Brooklyn, N. Y., with Riis Park, L. I.

SHEEP'S TAILS REQUIRE CARTS

Nic Sprank Offers $5.00 For Best Oddity



CARTS CARRY TAILS! SHEEP IN CENTRAL ASIA ARE FAT-TAILED.—THEY STORE UP FAT IN THEIR TAILS WHEN THE PASTURE IS GOOD. TAILS ARE OFTEN MARKETED WEIGHING EIGHT TO TEN POUNDS EACH.—FOR THEIR PRIZE SHEEP, SHEPHERDS SOMETIMES RIG UP LITTLE CARTS WHICH THE ANIMALS DRAG ALONG BEHIND TO HOLD UP THEIR TAILS.—
PAUL G. SWAIM, BERKLEY SPRINGS, W.VA.

NEW JERSEY SINKING! EVERY HUNDRED YEARS THE COAST OF NEW JERSEY SINKS ABOUT TWO FEET. SCIENTISTS PREDICT THAT IN SEVERAL THOUSAND YEARS, THE SEA WILL COVER THE PRESENT LOCATIONS OF TOWNS AND CITIES.—
R. GRIFFITH, LOUISVILLE, KY.

100,000,000 WITCHES DEAD! IT IS ESTIMATED THAT IN ALL LANDS ABOUT ONE HUNDRED MILLIONS HAVE SUFFERED DEATH FOR WITCHCRAFT. AMONG THE SIGNS BY WHICH A "WITCH" COULD BE RECOGNIZED WERE SUCH RIDICULOUS SYMPTOMS AS THESE: RESTLESSNESS; UNNATURAL STRENGTH; INTERTWINING THE FINGERS; INABILITY TO SHED TEARS; SPEAKING AN UNKNOWN LANGUAGE; AND NUMBNESS OF LIMBS.—
SCIENCE SERVICE.

ONE BILLION MATCHES A MINUTE! APPROXIMATELY 170,000 CIGARETTE BUTTS AND ONE BILLION MATCHES ARE USED AND THROWN AWAY EVERY MINUTE DURING THE TWENTY-FOUR HOURS OF THE DAY.—
A. J. Sprungman, Minneapolis, Minn.

Five dollars will be paid for the oddity selected by Nic Sprank as the best of the month. One dollar will be paid for all others used on this page. Send your oddity to Nic Sprank, Modern Mechanix Publishing Company, 1501 Broadway, New York, N. Y. Source or proof of each oddity must be given. Send all oddities separately, not with other manuscripts or letters.

"Camera Obscura" Checks Air Corps Bombers' Aim

This "camera obscura" device enables Air Corps bombers to practice without using costly bombs. Instead, radio impulses and photographic images are used to check accuracy

FOR practice bombing, the Air Corps has devised a "camera obscura" apparatus that releases not a bomb, but a radio signal with the speed of light. The device features a two-way radio unit and one of the largest photographic lenses ever designed.

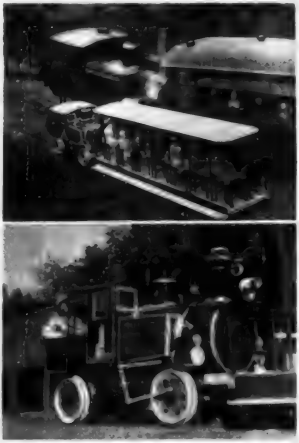
To practice bombing, the bombardier sights the "camera obscurer" and drops a "bomb" in the form of a single radio impulse. Meantime, on the ground, the plane has been sighted in the camera device and an operator has heard the radio impulse in his earphones. "Hits" are scored by mathematical formula.

X-ray Trailer Unit Built

CAPABLE of producing rays powerful enough to penetrate three-inch steel in a one-minute exposure, a compact X-ray apparatus has been installed aboard a special trailer by a Long Island firm. The cover of the trailer can be used for a field dark room, enabling comprehensive field inspections of welded bridge and building structures to be completed right at the scene of operation.

The body of this special three-wheeled trailer contains a compact X-ray apparatus that is used to examine welds in bridge and building construction. Ray pierces three-inch steel.

Tiny Cog Train In Service



Chugging along beside its "big brother" (top), a Tom Thumb cog train pushes its load along the track leading to summit of Pike's Peak, Colorado. Bottom—Close-up of midget engine.

A "TOM THUMB" edition of the world-famous cog railroad that ascends Pike's Peak in Colorado has been built by Spencer Penrose, of Colorado Springs. Like the big cog train, the miniature train is built so that the engine is level on the mountain grades. Power is applied to a cog wheel which meshes with a cog rail in the center of a track.

Mechanical Bugler Installed At Flying Field

THE familiar strains of "reveille" still sound over the Army Air Corps base at Mitchell Field, L. I., but the notes are no longer the result of the bugler's powerful lungs. Instead, a mechanical bugler in the form of a phonograph device with a crystal pick-up and amplifier attached to a loudspeaker serves to awaken the post.

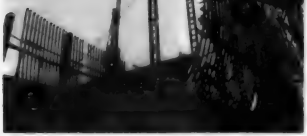
The phonograph and the amplifier are housed in a tower atop the post's administration building, while the loudspeaker is located outdoors on a balcony. A cabinet provides storage space for records on which are recorded the various bugle calls used. Mounted on a swivel-type stand, the loudspeaker can be turned to throw the sound in any direction. A canvas cover protects the loudspeaker against rain, snow, etc., when not in use.

Bugler Frank Kaufhold (top) seems amazed as he hears familiar strains emanating from the mechanical bugler now installed at Mitchell Field, L. I. Bottom—Charles Carmody starts the phonographic device which plays and amplifies bugle recordings. Records are stored in the slotted cabinet.

Biggest Ship In The Making

DESIGNED to be a sister-ship to the gigantic *Queen Mary* ocean liner, a new Cunard White Star passenger ship is in process of construction at a shipyard in Clydebank, Scotland. When completed, the new vessel will surpass the *Queen Mary* in size.

The steel castings for No. 552, as the new ship is known at present, are of unusual size and, to insure exact detail, patterns of each casting were first made in wood before work began on the actual steel framework. Over 1,300 tons of liquid steel were required for the castings used throughout the frames.



Work on a sister-ship to the gigantic *Queen Mary* has been started at Clydebank, Scotland. Shown here is the massive framework of the new ship, which will be the world's largest.

Radio Tube Has Many Uses

ESPECIALLY designed for use in ultra-high frequency or short-wave service, a new 7½-inch oscillator and amplifier tube has been developed by a leading manufacturer. Some of the main fields of application in which the new tube will be used, due to its unique characteristics, are therapy, radio, and other high frequency purposes.

Top—Route of the new buses traveling across the desert from Damascus to Baghdad. The 600-mile trip is made in fifteen hours. The only stop is at Rutbah.

Above—One of the new sleeper buses. These are slightly longer than the day coaches. The bus is air conditioned and insulated against the desert temperature.

Desert Travel Modern Style

by
Edgar M. Jones

SHUTTLING across the sands of the Syrian desert, between Damascus and Bagdad, are two shiny, new trailer-busses, fresh from the shops of Philadelphia. Built by Budd for the Nairn Transport Company of Syria, with the same technique of welded, lightweight, stainless-steel that made the now famous Zephyr trains, the new busses are a close approach to the luxury of a deluxe railroad car.

As in any public carrier, passenger comfort is of prime importance. Accordingly, the plans incorporated Budd experience in making railroad streamliners and auto bodies, with the Nairn need for an economical, speedy, lightweight, rugged bus which could travel the rough terrain with a minimum of trouble. To guard against the extreme temperatures of desert night and day (zero at times and often as high as 140 degrees), complete insulation and conditioning of air was specified. Leg room to equal Pullmans cut passenger capacity to seventeen in the day bus and fourteen in the sleeper. Extra wide chairs limited double seats to one side of the aisle and singles to the other.

The new busses lop nine hours from former crossing time and make the six-hundred-mile trip over trackless waste in fifteen hours, while passengers comfortably sway on rubber cushions. Coach seats face the front, but the sleeper is divided into compartments with seats facing each other. At bed time, the seat

Left—Interior of the sleeper bus. The upper and lower berths are ready for sheets, blankets and pillows. The day type bus carries seventeen passengers, and the sleeper, fourteen.

Right—Looking forward through the emergency door. Note padding at top of door to prevent bumped heads. A door swings into position for closing off wash room for dressing and shaving.

backs swing up to form upper berths supported by tubular frames. The gap between the seats is filled with an extra cushion and the lower is made. Sheets, pillows, blankets and curtains make the berths ready for sleepy travelers. Lighting and adjustable outlets for conditioned air are provided for each berth.

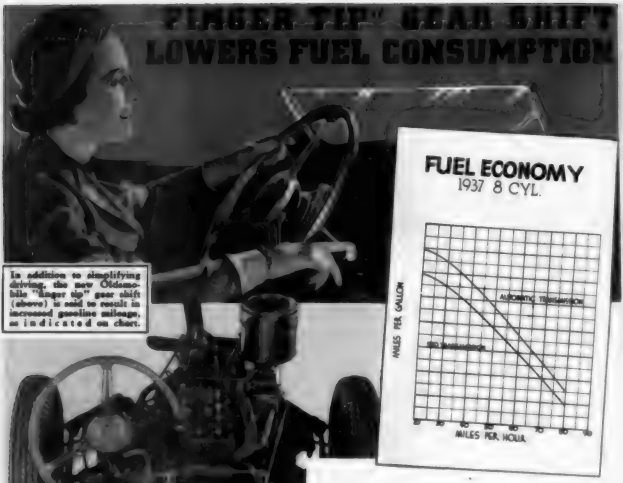
Following a formula akin to the hostess or steward plan on American airlines, a native throughout the trip comforts passengers with ice water, tea and coffee as well as box lunches with wrapped sandwiches and fruit. Each patron is provided with a small container having a patented lock for the protection of tooth brush, cash, jewelry, etc. Lockers for storing blankets, pillows, clothing and miscellaneous equipment are in the front of the trailer, while the rear has a dressing room which also contains wash basins and toilet facilities.

The flooring is surfaced with heavy linoleum which extends up the walls for six inches so that a flushing by hose is possible.

[*Continued on page* 120]

Zippers which pull from the inside close the curtains for complete privacy for those in the berths. There is sufficient height in the berth compartment to permit a person to sit erect. Each passenger is provided with a small container for the protection of cash and jewelry.

"FINGER TIP" GEAR SHIFT LOWERS FUEL CONSUMPTION



In addition to simplifying driving, the new Oldsmobile "finger tip" gear shift (above) is said to result in increased gasoline mileage, as indicated on chart.

The automatic transmission, operated by a "finger tip" control lever, is actuated by oil pressure and engine speed through a series of cables as shown by this demonstration motor.

A TWELVE to eighteen per cent increase in gasoline mileage, increased acceleration, and reduced engine wear are claimed for a new type of automatic gear shift. The new transmission dispenses entirely with the conventional gear shift lever, the driver controlling the transmission gears by a short lever located below the steering wheel.

The new transmission features four forward speeds and selects them automatically through a device actuated by oil pressure and engine speed. At the touch of a finger, and without removing either hand from the steering wheel, the driver can move the gear shift lever from its neutral position into either one of two forward ranges of gears designated as "high" and "low." Within these two ranges are included the four forward gears. Use of the clutch pedal is necessary only when going into reverse or when starting.

When starting in the "low" range, the driver depresses the clutch pedal, moves the finger tip gear shift control to the proper point and releases the clutch. As the auto picks up speed, the transmission changes automatically to second gear. Without declutching or releasing the accelerator, the driver then flicks the control to the "high" range and the gears automatically progress on through third and into fourth speed.

The "low" range includes first and second gear. The "high" range offers first, third and fourth, the first gear being provided in both ranges in order that the driver may, if desired, start in the "high" range when the motor is warm or when the start is not made up a grade. When starting directly in the high range, the gears automatically progress from first to third to fourth gear. Developed by Oldsmobile, the automatic gear mechanism turns the engine at approximately 2,500 r.p.m. at 60 miles per hour as compared with an approximate figure of 3,100 r.p.m. for autos having conventional transmissions.

Fokker Produces Three-In-One Military Plane

FEATURING a cruising range of 1,000 miles and a maximum speed in excess of 300 m.p.h., a new combination type (combat-pursuit-bomber) airplane has been developed for the Dutch Air Force by Anthony Fokker, famous aircraft designer. Known as the G-1, the plane is powered by two air-cooled Hispano-Suiza motors of 800 horsepower each.

The Fokker plane carries two cannons of 23 mm caliber, and three machine guns, one of which is mounted in a specially constructed revolving cupola located at the rear end of the fuselage. The craft has two tails, the fuselage being mounted in the wing between them.

This Fokker G-1 combination combat-pursuit-bomber airplane was built for the Dutch Air Force. The fuselage rear end (between the two tails) features a revolving gun turret.

Model Aids Anatomy Study

John Broomfield, of the New York Museum of Science and Industry, examines "Miss Anatomy", a life size figure containing organs that can be removed for health lecture purposes.

"MISS ANATOMY," a life-size female figure sculptored from actual life and featuring internal organs that can be removed for lecture purposes, has been placed on exhibition at the New York Museum of Science and Industry in Rockefeller Center, N. Y. C.

Fish Scores On Glider Pilot

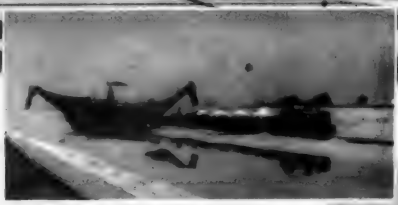
A FISHING tale with a modern twist is provided by an adventure that befell Don Stevens, well known glider expert of Venice, Calif. Unlike most fish stories, however, a cameraman was at hand to record the fisherman's novel experience.

Desiring to combine the pleasure of flying with that of fishing, Stevens piloted his amphibian powered glider to a favorable site and cast his line. In a short time he hooked a small, but powerful, barracuda. In the ensuing excitement, Stevens grabbed the line, slipped, and fell through the wing of his glider. When the glider finally drifted ashore, the barracuda, strangely enough, was still on the hook.

Catching fish from aboard his powered glider did not work out so well for Don Stevens, of Venice, Calif. A few minutes after fish was caught Don lost balance and fell through wing.

SWAMP LANDS

Top—The source of supply. Eight thousand acres of salt water ponds with the main refining plant in center.



Above—The modern method of harvesting salt. Loading machine picks up salt and places it in small dump cars hauled by tractors.

by Bob McLean

DO YOU, perchance, own an apparently valueless bit of land situated near salt water? Some uninviting mud-flat that may have been foisted upon you or your ancestors? Perhaps you consider it of no use whatever save for the raising of cat-tails and mosquitoes, and its possession rankles your mind with a tormenting persistency that will not be assuaged. You'd be glad to sell or even give it away, could you but find someone to accept such a futile gift.

But wait!

That "worthless" acreage—as has been demonstrated in California—may yet bring a fortune!

Given a few other essentials such as sunlight, access to transportation facilities and a market for your product, the mud-flat may be ideal for raising one of the prime necessities of life—salt.

Because the production of salt is one of the world's most stable industries, the average person is inclined to take this homely product pretty much for granted. In early times it was obtained entirely from natural deposits, but as the earth's population increased, these primitive sources of supply became insufficient for the constantly growing demand. Governments and private individuals experimented with various methods of producing salt artificially. Few people outside the "trade" however, know that today salt is actually farmed. Planted, cultivated, harvested; just like any other crop.

On the eastern shore of San Francisco Bay, close to the little town of Alvarado and some

Bring FORTUNE

A relic of the early days of the Alvarado Salt Farms. Called the Archimedian windmill, it received its name because the ancient Greek mathematician Archimedes is credited with being the first person to construct a windmill for pumping water.

similar period in any other "farming" section on the globe. Instead of exporting fruit, grain and produce, the Alvaradams send trainloads of scintillating, snow-white crystals chugging away from the old-fashioned wooden depot, destined for all the ports of the seven seas.

During the harvest festival, the sturdy Salt King and his glamorous queen reign for a few days in robes of purest white. Tinkling mandolins, strumming guitars, and the entrancing aroma of barbecued beef, delight the Spanish and Portugese workers of the salt farms.

Strangely enough, the story of salt throughout the ages has always been accompanied by pageantry. From the time of Homer, about 850 B. C., down through all the centuries, the history of salt is interwoven with the tramp of marching

[*Continued on page 126*]

Above—A 75,000-ton pile of salt. Its height may be judged by comparison with telephone poles at its base. Right—A battery of triple vacuum evaporators in which the salt is dried and purified.

fifteen miles from the city of Oakland, California, are located the Alvarado Salt Farms. Eight thousand acres of formerly unproductive tidal lands, they now supply a good proportion of the world's salt.

Harvest time in Alvarado, during the early part of August, is utterly unlike a

U. S. Navy Completes Test Of One-Stack Destroyer

The *U. S. S. Gridley*, first single-stack destroyer ever built in the western hemisphere, has successfully completed trial runs. Torpedo tubes and five-inch guns comprise armament.

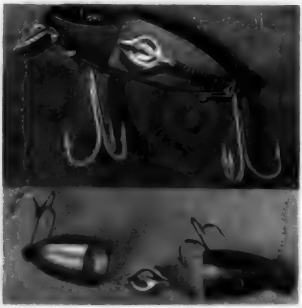
THE first single-stack destroyer ever built in the western hemisphere, the *U. S. S. Gridley*, has been given her trial run by the U. S. Navy. The trial was so successful that construction of a sister ship has already been started. The destroyer is 330 feet long and has a beam of 35 feet. Rated at 1,500 tons, the craft is powered by a twin-screw geared turbine, taking steam from oil burning watertube express type boilers. Armament consists of torpedo tubes and five-inch guns.

"Rocket" Car Goes 40 M.P.H.

EQUIPPED with a one-cylinder motor that provides propulsion based on the theory of the fluid rocket, a novel midget car has been developed by Millet, famous Paris engineer. On its trial runs, the three-wheeler car is said to have attained speeds exceeding 40 m.p.h. The all-metal car is bullet-like in its appearance.

Capable of traveling at 40 m. p. h., this novel three-wheeled auto employs the theory of the fluid rocket to provide propulsion. Millet, famous Paris engineer, is driver-builder

Fish Lure Uses Neon Glow



When placed in water and agitated, this fish lure (top) throws off a glow to attract fish. Mercury and neon gas confined within a small bulb (lower photo) are the secret.

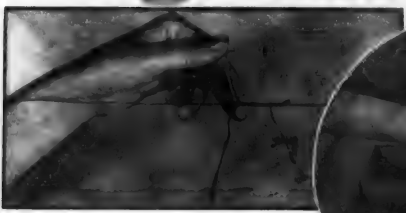
EMBODYING a new use for neon gas, a luminescent fishing lure has been invented by Michael F. Murray, of St. Paul, Minn. On a recent fishing trip, users of the new lure are said to have caught double the number of fish hooked by non-users.

The lure consists of a fish-shaped celluloid tube inside of which a small glass bulb filled with mercury and neon gas is placed. Agitation causes the ball to throw off a glow that attracts the fish. Three-pointed hooks are attached to lure's head and tail.

SHOP TIPS

Spencer Tracy shows the right and wrong ways to hold a hammer. Right: Drilling accurate holes in thin work is simplified with this jig.

Making large holes is easy if you have the right tools. For holes up to ½" in wood or thin metal, use a rose countersink, A. For holes from ⅛ to about 1¼", start with a ¼" drill and finish with a burring reamer, B. For holes in wood up to 3" diameter, use the adjustable expansion cutter, C. For holes in sheet metal up to 6", the adjustable fly cutter, D, is the tool.



Above: the electrical resistance of twisted wire joints can be lowered, and their mechanical strength increased, by the use of a tie wire consisting of a piece of No. 22 or 24 solid wire.

Right: For picking up small screws, nails and other objects in the home workshop, nothing is as good as a pair of ordinary tweezers. This is also useful for cleaning out bottomless holes.

WOODCRAFT

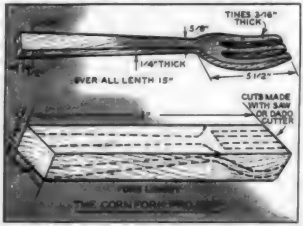
Finding many applications in the kitchen, these novel utensils, which include a wooden fork, spatula, slotted ladle and vegetable chopping knife, cost little or nothing to make. Scrap pieces of wood are only materials needed to make them.

by Dale R. Van Horn

ALTHOUGH elementary workshop projects, these woodcraft kitchen utensils will more than please any busy housewife fortunate enough to receive them. Except for the vegetable chopping knife, the cost of materials is nothing, since scrap pieces of wood are used in making the novel kitchen accessories.

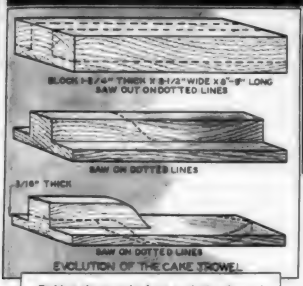
The *double bladed knife*, for instance, will save half the usual chopping strokes when making vegetable salads. First get two blades from cheap dime store knives or two old blades reground to the same shape; then cut three pieces of figured gum or black walnut 4½ inches long, 1¼ inches wide and ¼-inch thick for the handles and spacer. These dimensions may vary, depending upon the blades used. Locate the rivet holes and bore the holes through one piece. Use this as a guide to accurately bore the holes in the other two pieces. With rivets or nails to hold them in line, sand all three pieces at a time on the front end, giving it a slightly rounded shape.

The vegetable chopping knife segments are shown here before assembling. The handles and spacer, which are cut from figured gum, are drilled with holes corresponding with those in the knife blade, and the knife assembled with copper rivets.

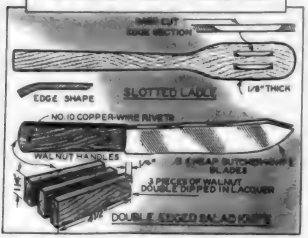


Handy for removing corn and other hot vegetables from the fire, this wooden fork is extremely easy to make. The fork is cut out on a jig saw from any available stock. Prongs are quickly formed to correct shape with ⅛ inch dado cutters.

KITCHEN CREATIONS



Fashion the spatula from a single piece of stock measuring 9 by 2½ by 1¾ inches, cutting it in the progressive manner shown here. Final finishing is done on a sanding wheel.



The slotted ladle described in the above detail diagram is made in much the same manner as the wooden fork. Paddle slots are likewise made with dado cutter. Below ladle is shown the assembly detail of the double bladed salad knife.

Space the blades and then rivet the blades to the handle. In this case No. 10 annealed copper wire was used for riveting. To insure a good job, each outside hole should be reamed out with the next larger drill to a slight depth, and the riveting finished by holding one end of each wire in the vise while the rivet head is being hammered. Later the knife is turned over and the other end riveted. The sanding disc, with fairly coarse grit and turning at high speed, is used for shaping the handles and also for grinding off the surplus copper. The handle is next hand sanded with finer grit, then rubbed well with fine steel wool and finally double dipped in clear lacquer. A beautiful job will result, providing a utensil that will find an unlimited number of applications in the kitchen.

A slotted ladle is handy for stirring batters and is very easily made. Quarter-inch dado cutters are used in conjunction with a stop block held to the saw table with a clamp, to make the slots. These are made before the handle is jig sawed to rough shape. The rest of the finishing is done with the drum and disc sander, the disc sander taking care of the flat portions, the drum sander finishing the curved portions.

Steel wool and lacquer provide the finish. A better finish for this particular use is hot paraffin. Beeswax is even better, but of course these waxes cannot stand hot water. The wax finish is applied by melting down a tin can of paraffin and flowing the hot wax over the wood with a brush and rubbing until air bubbles no longer rise to the surface of the wood fibers. When the wax is cold, the surplus is rubbed off with a coarse rag. You will find that the slots have thin edges of wood at the ends. Remedy these by rubbing a flat file over them.

Ideal for removing steaming ears of corn from the kettle is this over-sized fork. Made in much the same manner as the ladle, the

[*Continued on page* 130]

SCAN THE SKIES
POWERFUL HOME-

by
R. DeWitt
Miller

A large metal mounting holding a twelve-inch mirror. This is a machine made precision mounting of the finest type. It is the property of the Amateur Astronomical Society of Los Angeles.

PART III

ALL efficient telescopes are mounted by what is known as the "equatorial" method. This simply means that the mounting is designed in such a way that the optical system will swing in the same curve as the stars. This curve is caused by the inclination of the axis of the earth. The telescope must therefore be mounted in such a way that its primary axis is parallel to the axis of the earth. The angle of this axis to the ground should be equal to the latitude of the observer.

As far as the minor details go, mountings are as different as the people who make them The more elaborate metal mountings are undoubtedly more rigid and accurate than the simple wooden ones. On the other hand, they are expensive to construct, and require the use of precision, power-driven tools.

The amateur attempting his first telescope is anxious to see as quickly as possible how his mirror will perform. He is generally not interested in the "aesthetic side" of mountings.

For these reasons it is better for the beginner to construct a simple wooden mounting. If, after he has seen his mirror once in operation, he is enthusiastic to attempt a metal mounting, well and good.

Such a wooden mounting, capable of being constructed out of material obtainable by anyone, will be described in this article.

First of all, the mirror must be placed in a proper cell. This is constructed by turning out a wooden dish with an inside diameter slightly more than that of the diameter of the mirror. This should be constructed of well seasoned wood. It should be shellaced

WITH THIS MADE TELESCOPE

to prevent warping due to absorption of moisture.

The mirror is held in the cell by a series of small wood or metal cleats distributed around the edge of the dish, three being sufficient. Some sort of cover—a second dish turned out of wood—should be made. This will shield the mirror from dust, moisture, and weather conditions. It should be kept in place whenever the mirror is not in use.

Two other items are necessary to complete the optical system of the telescope. These are an eyepiece and a prism.

The eyepiece should have a one-inch focal length. This is not expensive and can be purchased from any reliable optical dealer. Some advanced amateurs grind their own eyepieces, but this requires special knowledge and equipment. A positive or Ransden type eyepiece is recommended, but a Huygenian will answer well enough. This is the type commonly used in microscopes.

The prism deflects the light from the mirror, bending it at a right angle, and directing it into the eyepiece. A full reflecting prism is

A photograph of the wooden mounting described in this article. The six-inch mirror is shown at the bottom. Simplicity of construction is noticeable and the worker should experience little or no trouble with construction. With the mirror completed, rest of the work progresses rapidly.

A portable eight-inch telescope made by a Los Angeles amateur. The excellence of the result is indicative of the painstaking work of telescope builders. This hobby is growing by leaps and bounds toward a degree of popularity believed impossible a few generations ago.

the type used for this purpose. A well chosen piece of windshield glass silvered on the back will do. Prisms are inexpensive and may be purchased from any optical dealer. The prism should be a one-inch size.

The materials necessary for constructing the mounting are as follows:

A piece of well-seasoned, straight-grained wood at least one and one-half inches thick and six inches wide. It should be as long as the focal length of the mirror.

A piece of brass tubing six inches long with an inside diameter the same as the outside diameter of the eyepiece. This will be cut as described later.

A wood block about six inches square and two or three inches thick.

A six-inch square piece of one-inch board for holding the mirror cell.

A piece of one-inch shafting two feet long.

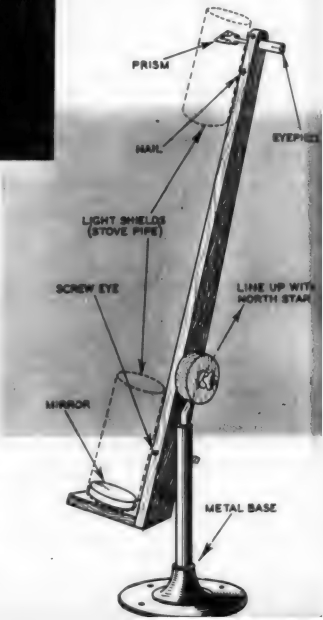
A section of two-inch steam pipe two feet long.

A bolt with a wing nut. The bolt should be long enough to go through the large plank and the block.

The mounting is constructed in this order:

The piece of steam pipe is fixed into the concrete base. Unless this base is firm, you will have nothing but trouble with your mounting

The shafting fits into the steam pipe with enough space around it to allow cement to be poured in. The end of the shaft is bent in such a manner that it will point directly at the North Star. After having the end of the bent shaft lined up with Polaris, cement is



poured around it and allowed to set. This is not an absolutely accurate equatorial mounting, as Polaris travels in a circle around the true North, but it is sufficiently accurate for all practical purposes.

Two holes are bored in the block, one for the bolt and one for the shaft. The wing nut on the end of the bolt allows pressure to be applied as desired. It is a good plan to slot the block where the shaft enters it. A wood screw can then be used to take up the slack when the block becomes loose on the shaft.

As the board holds the optical system in line, it must be straight and well seasoned. The block is screwed to the lower end and the mirror fastened to the center of the block. At the other end a hole is bored to take the brass pipe. One end of the pipe is cut so that the two ears will hold the prism. The other end of the pipe is slotted so that it will hold the eyepiece. The remainder of the tube is cut away so that it will offer no more obstruction than necessary to light falling on the mirror.

The distance between the mirror and the prism must be so calculated that it is equal to the focal length of the mirror less the distance between the prism and the focal point eyepiece. The top of the board is slotted and a wood screw used to hold the focusing tube firmly in place.

Before the mirror is fastened in place it is moved around until the prism is exactly centered. This may be checked in the following manner: With your eye well behind the prism, note whether the reflection of the prism is in the center of the mirror. If the reflection is off center, move the mirror until it is centered.

The prism itself is adjusted by taking out the lenses of the eyepiece and looking into the adapter. The prism should be moved by filing the ears. It should be adjusted so that

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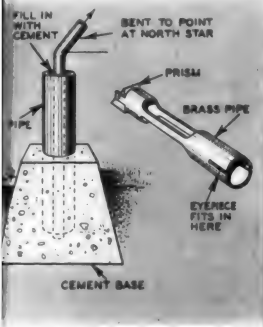
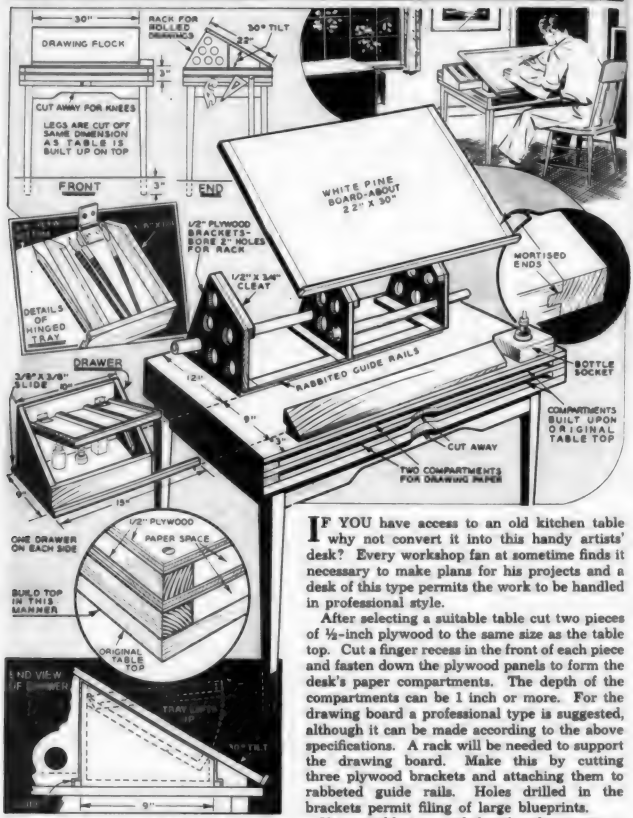


Artist's drawing of mounting for the mirror described in past two installments. Construction details are self-explanatory and builder will experience few difficulties.

Right—Central portion of a Pasadena type mounting. This photograph clearly illustrates the equatorial type mounting. This is but one of the many mounting types.

ARTISTS' DESK

MADE FROM OLD KITCHEN TABLE

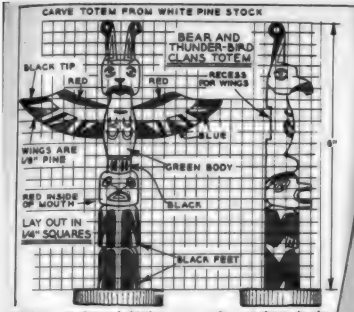


This easily built artists' table will find many uses in the home workshop. An old kitchen table provides a suitable stand for paper shelves and drawing board rack. Pen and ink cabinet with sloping panel slides under drawing board.

IF YOU have access to an old kitchen table why not convert it into this handy artists' desk? Every workshop fan at sometime finds it necessary to make plans for his projects and a desk of this type permits the work to be handled in professional style.

After selecting a suitable table cut two pieces of ½-inch plywood to the same size as the table top. Cut a finger recess in the front of each piece and fasten down the plywood panels to form the desk's paper compartments. The depth of the compartments can be 1 inch or more. For the drawing board a professional type is suggested, although it can be made according to the above specifications. A rack will be needed to support the drawing board. Make this by cutting three plywood brackets and attaching them to rabbeted guide rails. Holes drilled in the brackets permit filing of large blueprints.

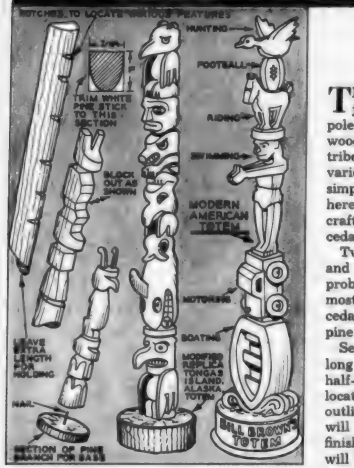
If your table is provided with a drawer it can be fitted with partitions for holding ink and pens, otherwise a small sloping panel cabinet can be made to slide under the drawing board.



Miniature versions of Alaskan totem poles are shown in the photograph at right. Totems are carved from cedar or white pine stock. Lay out design on ¼" square pattern as above.

CARVING MINIATURE TOTEM POLES

by Hi Sibley



In carving the totems, first select a length of 12" x 1" x ¾" pine and whittle it to oval shape, then pencil in the design. A modern version of the ancient pole is depicted at right.

THE craftsman who likes to carve with a jackknife will find the miniature totem pole an interesting subject. These colorful wooden monuments of the Thlinket Indian tribes of southeastern Alaska embrace a wide variety of subjects, usually animals, and a simple design for the beginner are presented here. This is a favorite subject with native craftsmen who whittle facsimiles from red cedar and paint in gay colors.

Two figures only are represented, the bear and the Thunder Bird, a mythical creature probably derived from the eagle. Although most of the full size totems are hewn from cedar the amateur will doubtless find white pine an easier medium with which to work.

Select a straight-grained piece about a foot long and ⅞ by 1 inch and trim it down to a half-oval section. Next, notch the stick to locate the various features; then make a pencil outline to aid roughing out the figures. It will be well to block out only the bird and finish before roughing out the bear so there will be no strain on the reduced stick. The legs and toes of the bear are formed by making "V" grooves as illustrated.

[*Continued on page* 132]

HOME EXPERIMENTS FOR THE

A PIN HOLE MICROSCOPE—If you look through a small pin hole in a card, an object may be held very close to the eye and it will appear to be magnified four or five times. Blacken area around hole to prevent reflection of light. Ordinarily, an object close to the eye would be blurred, but the pin hole restricts the rays to the center of the eye lens, thereby resulting in less dispersion and removing the need for sharp focus.

A MIRROR MAZE—Place three mirrors, facing inward, to form an equilateral triangle. A maze of triangles and hexagons will extend as far as you can see. In the photograph, although many ink bottles are showing, actually there is only one. Reflections result from the fact that there are no surfaces but mirrors and the reflections travel back and forth, causing the maze to grow larger and larger with the speed of light.

A ONE PLANE PENDULUM—Fasten a weighted object to the back of a rocking chair by a piece of string or thread and swing it in a circle as shown in the photograph. After a number of swings the rocking of the chair will absorb all the motion except in one plane, as shown by the arrows. Regardless of the direction in which the pendulum is started, any motion except in direction of the arrows will be damped out.

AN ELASTIC SOAP FILM—Tie a loop of fine thread so that it hangs loosely within a wire loop. Obtain a soap film by dipping the wire into a dish of water. Break the film inside the small loop and the soap film will pull it into a circle as though the film were made of rubber. This elastic characteristic of soap film is caused by surface tension, or attraction between molecules.

AMATEUR PHYSICIST

GLOWING ALUMINUM PLATES—Place two aluminum plates in tumbler containing a borax or baking soda solution and connect with electric power source as shown. When first connected to 110-volt A.C. source, the bulb will light. After a short time it will become dimmer and dimmer until it finally goes out. Aluminum plates will show pale orange-yellow glow.

A WEIGHTLESS POINTER—Reflect a beam of light by a small mirror fastened to the clock hour hand shaft. Spot of light from the mirror moves perceptibly with each clock tick if the spot is far enough away. The hour hand of ordinary clock moves .00005 inch with each tick. With spot fifty feet away from mirror, motion is magnified about 1,000 times.

Overhauling The Car

by Frederick C. Russell

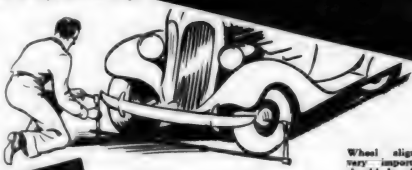
Re-conditioning of the modern auto is a serious matter. How and when it should be done is explained in this article.

WHAT? Overhaul the car after the vacation trip is over?

Yes, and that isn't all. It doesn't have to be springtime to make the overhauling job timely. Topping the list of new viewpoints regarding overhauling the automobile is the idea that the complete tune-up should be given when the car needs it, not when it's so late as to be a process of repairing actual damage—a costly process.

Cars work hard on their summer trips. They often are badly neglected. Miles pile up without owners realizing it. This is followed by a busy fall with many shorter trips hurriedly taken. Winter comes, and care of the car is far behind.

If a car could talk it probably would say that it wants what it wants when it wants it. Millions of cars have passed beyond the point where they could ever hope to be brought back into a state of good health just because their owners waited until springtime to get out and get under. Millions of cars have gone to the junk pile simply because their owners had a mistaken idea as to what their cars really needed by way of service or repairing.



Wheel alignment is very important and should be done with approved equipment.

Why is it, for instance, that so little thought is given to the chassis? How can any engine, no matter how pampered, deliver sufficient power to the rear wheel if too much of this energy is lost en route? Remember that, due to friction, only a small percentage of the power generated in the engine actually is available for propelling the car, even when clutch, transmission, universal joints and final drive gears are in the pink of condition. What, then, is the advantage in seeking a top-notch valve job if the clutch is

There are sixty-four different items which should be considered in the process of tightening the chassis of the car from one bumper to the other. It is here that all body noises usually originate.

AFTER The Vacation Trip

When brake linings are replaced it is highly important that the linings are matched sets. Select a type designed for your car!

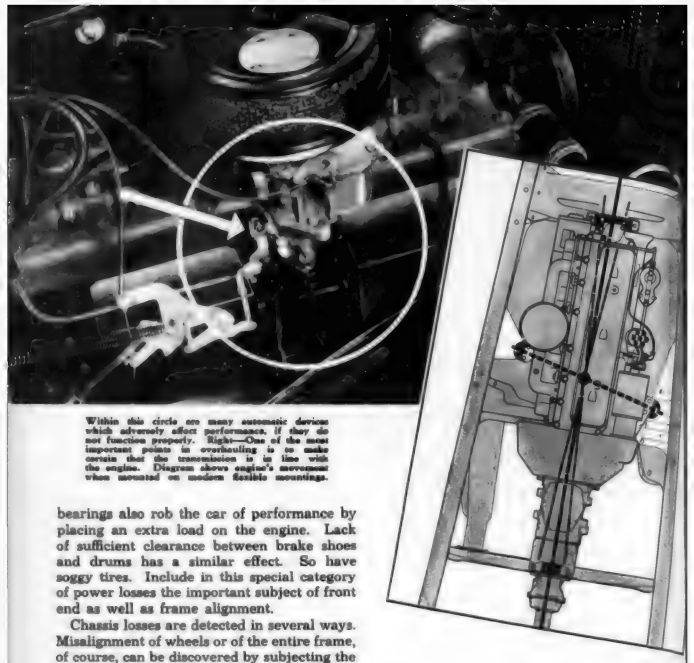
Modern analyzing equipment aids accurate testing for faulty spark plugs. A small magnifying glass aids home mechanics in determining point condition.

allowed to slip? Why have the cylinders rebored or the bearings tightened, if there is an incorrect mesh of the pinion with its ring gear?

Or, assuming that the car has a hypoid gear rear end, why re-check timing, if the owner doesn't take the precaution of using the extreme pressure lubricants needed with this type of final reduction gearing?

Losses are by no means confined to internal trouble with these major units. It will never be known how many millions of gallons of gasoline have been wasted through their misalignment. Where the transmission isn't in a direct line with the engine shaft it becomes necessary to send power "around a corner." It is like adding extra universal joints but without any provision for offsetting the added friction. Tight wheel

The new accepted method for bumping out dented fenders is a modern application of the compressed air hammer. Its use renders repairs invisible.



Within this circle are many automatic devices which adversely affect performance, if they do not function properly. Right—One of the most important points in overhauling is to make certain that the transmission is in line with the engine. Diagram shows engine's movement when mounted on modern flexible mountings.

bearings also rob the car of performance by placing an extra load on the engine. Lack of sufficient clearance between brake shoes and drums has a similar effect. So have soggy tires. Include in this special category of power losses the important subject of front end as well as frame alignment.

Chassis losses are detected in several ways. Misalignment of wheels or of the entire frame, of course, can be discovered by subjecting the car to the testing equipment now so commonly used by well equipped service stations. Lubrication check-up takes but a short time. If there is any doubt regarding the quality of the lubricant in the transmission or rear end the wisest course is to drain off the old and refill with lubricant of known quality. Service experts warn against mixing hypoid gear lubricants, and from this we are learning a good lesson in not mixing lubricants for any type rear end. The same view of transmission lubricant has its advantages. Every time such units are drained off their life of usefulness is increased, due to removal of fine particles of brasive.

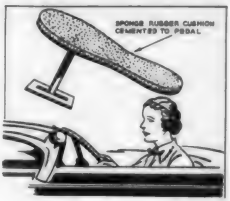
It is not so easy to detect and correct misalignment of the major units of the drive line. The theory is that the shafts of the engine, clutch and transmission will seek their own level, if not cramped or restricted. Thus, if there is a question regarding their alignment, it is well to loosen the bolts which hold them in position and then retighten them. Except in cases of strain from an accident these parts should not get out of line in a way that re-assembly will not correct.

If there is excessive power loss in the chassis this can be noted by failure of the car to coast properly. Select a quiet street and see how freely the car will roll along after being powered to a speed of around 20 miles per hour. Tight wheels should be the first target for suspicion. If so, it will save a lot of time and effort to take the car to a brake service station where the condition of all four wheels can be detected at the same time. In cases of this sort the chances are that there will be dragging brakes. This, in turn, may be due to grease working into the brake drums. Such

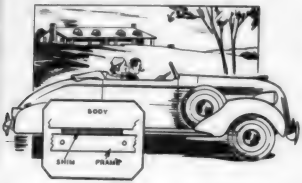
[*Continued on page 118*]

NEW KINKS for the MOTORIST

Accelerator Pad Eases Driving



A SPONGE rubber pad attached to the accelerator pedal of the car provides a cushion for the foot and insures added comfort while driving. Cut the cushion, to the shape of the accelerator foot rest, from a piece of sponge rubber kneeling pad such as sold in ten-cent stores, and attach it to the pedal with rubber cement. Apply an even coat of cement to both pedal and sponge pad, allowing both to dry before pressing the two together.—Kenneth Murray.



Shims Eliminate Body Noises

WARPED doors and excessive body rattles can very often be traced to the chassis or body of the car being twisted out of alignment. To correct this annoyance loosen all body bolts and place wooden shims between the body and chassis, at the source of the trouble, and tighten. The shims will raise the warped members, permitting the car doors to be opened without force.—Burl Knutson.

Pumice Sponge To Clean Windows

THE windshield can be easily cleaned of bugs and dirt by inserting a piece of pumice soap in a slit cut in a rubber bath sponge so as to provide a pocket for the soap. If the motorist so desires, he may cement the end of the sponge together with rubber cement so as to prevent the soap from dropping out.

To use this handy auto accessory, dip the sponge in water and squeeze it out before applying it to the windshield. The dissolved particles of soap will penetrate through the sponge so as to provide the desired results.—Kenneth Murray.

Hose Clamp For Battery Cable

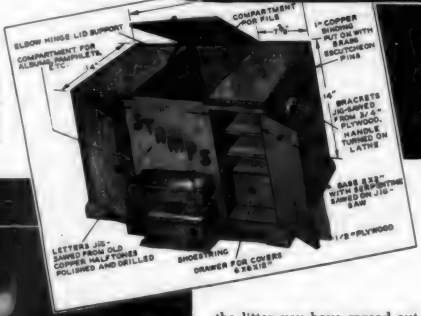
WHEN an emergency battery post clamp is needed, a garden hose clamp can be substituted to provide a good, clean and tight, connection. Solder flexible cables to the hose clamp and grease the outside surface of the metal band with vaseline or heavy oil so as to provide a protective film against battery corrosion.

Slip the clamp in position over the battery post and tighten it with pliers, if of the wingnut type, or with a screwdriver if it is fitted with a machine screw; the latter being the most common type in use.—E. F. Zimmerman.

A STAMP FILE

IF YOU are a stamp collector of the ordinary variety, you have an album or two, a letter-file containing stamps in full sheets, a handful of glassine envelopes in which you keep blocks, pairs and valuable duplicates, a package of covers, a few cigar boxes full of valueless duplicates, and a drawer in the desk or buffet for your tongs, watermark detector, gauges, etc. In short, your stamp collection is not very well "collected."

Moreover, you have probably been embarrassed many times to observe the litter you have spread out on the dining table during an evening session with your stamps.



This perspective view shows the general construction details of the stamp file. Plywood is used for top and sides; base is made from pine.

Here is a way out of your bewilderment: a stamp collection that is all together.

Its size will depend largely upon your present and anticipated needs while construction will depend upon the amount of energy and money you care to spend on it. It will bring you a vast amount of satisfaction, however, to be able to tell at once how many duplicates of a certain stamp you have, to know exactly where your covers and your collected but unclassified stamps are; and to be able to enjoy an evening with your stamps without cluttering up your surroundings on having to look for misplaced things.

Individual stamps are stored in pockets of pleated folders made from 110-pound bristol boards 9 by 15 inches in size.

FOR THE COLLECTOR

The pleated bristol folders are made by scoring the paper with a dull knife in the manner shown and folding. Brass tacks driven in drawing board serve as rule guides.

This cabinet-file can be a fine piece of furniture, and is admirably suited for specialized or generalized collecting, for beginners or old-timers. Its construction is mainly of plywood, stained and shellacked or varnished. The corners are bound with strips of copper sheeting, tacked in place with round-head brass escutcheon pins. The letters for "STAMPS" are cut with a jig-saw from old copper half-tones, polished, drilled and attached with the brass tacks. Handle-brackets are jig-sawed from ¾-inch plywood and the handles are turned on the lathe or cut from doweling. The bottom for the center compartment and the pigeon-hole divisions are set in dadoed slots; the top drawer also runs in similar slots by allowing the bottom to extend ¼-inch on each side. No cleats are ever used. The base is cut from 2 by 2-inch, mitered at the corners, with jig or band-sawed serpentine. All interiors are buff enameled. The cost of materials will not exceed four to five dollars.

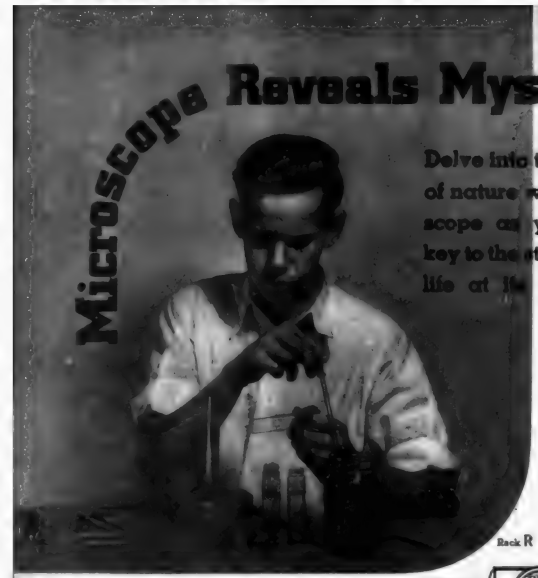
By examining the photographs and drawings you will see the general construction of the cabinet. One of the end compartments is partitioned into pigeon-holes and a drawer. Empty match boxes may be kept in the pigeon-holes, and in these you may keep common current stamps which have been removed from cover, stacked neatly into cubes and tied with threads, pending the day they may increase in value. The drawer is to contain your covers and postcards. If you care to, you may add a second drawer in this compartment into which you may drop stamps for later classification. Or, you may drop unclassified stamps into a match box and keep them in the bottom center drawer until catalogued.

The other end compartment is left

[*Continued on page* 149]

After folding the bristol paper to form stamp pockets they are pressed flat and secured with gummed tape as shown in sketch. Lower photo shows the novel stamp file in use

Microscope Reveals Mysteries



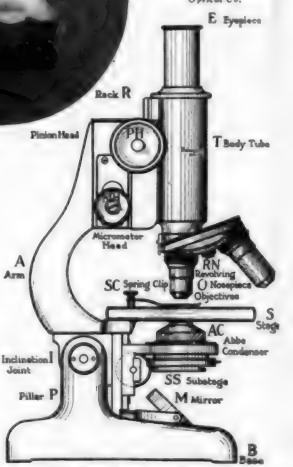
Delve into the wonders of nature with a microscope as your magic key to the storehouse of life at its conception.

PART II

POSSESSION of a compound microscope opens up many strange new lands for exploration, some of which were briefly described in the first of this series, appearing in the September issue of MODERN MECHANIX. Of all these realms, however, none is so marvelous as that of the Freshwater Microcosm, the assemblage of minute forms of animal and plant life that occur wherever a bit of water stands for any length of time.

Nearly everyone is familiar with the more conspicuous inhabitants of ponds, streams, pools and ditches. There we expect to find water snakes and tadpoles, dragonfly nymphs and mosquito wigglers, small minnows and the ubiquitous crayfish. But only the observer who is armed with a microscope knows of the myriads of invisible denizens that are to be met with in such situations; more amazing than Alice's friends of Looking-Glass Land; more grotesque than anything encountered by Gulliver on his voyages; more complexly weird than fictitious creatures conjured by the imagination of a Poe, a Verne or a Wells!

Charts copyright by Bausch & Lomb Optical Co.



The amateur biologist should thoroughly acquaint himself with the mechanical construction of his microscope before attempting any experiments. In this chart, all working parts of a typical laboratory instrument are shown and clearly labeled.

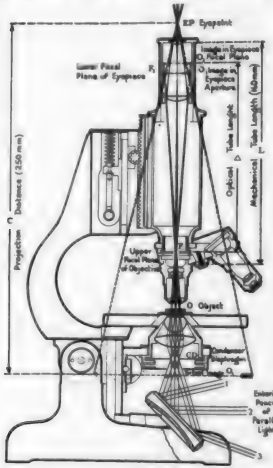
# of Life in WATER DROPS

by Julian D. Corrington, Ph.D.

If these statements are not exaggerated, then a trip through the microcosm ought to be indeed a vivid experience. Let us try it out and see what can be discovered.

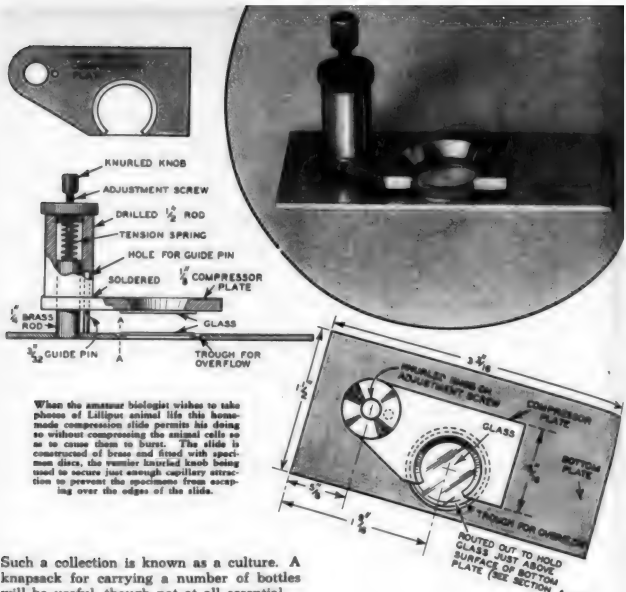
A fresh or salt water pond or marsh, a back-water eddy in a stream, a roadside ditch or pool, provides an excellent source for specimen samples. The fountains, cement-lined pools of our city parks and the tropical fish aquarium will be found to have their microscopic fauna and flora.

Collecting is simple and all one needs are some thoroughly cleaned, wide-mouthed bottles, preferably of the smaller sizes. Go afield to as many of the above situations as your locality permits, and immerse a bottle with the cork still in place until it is held on the bottom of the chosen pool. Release the



This cross-section view of the microscope shows how magnification is produced. The combination of lenses in the objective provides an enlarged image which the eyepiece again magnifies. The use of combined lenses insures a sharp image.

cork with the fingers and allow the water to rush in, meanwhile stirring up the bottom muck and poking in a bit of decayed leaf, soil and other bottom material to the amount of about one-twentieth of the capacity of the bottle. Replace the cork, bring bottle to surface, wipe dry and affix a gummed label on which is to be written the place and date.



When the amateur biologist wishes to take photos of Lilliput animal life this home-made compression slide permits his doing so without compressing the animal cells so as to cause them to burst. The slide is constructed of brass and fitted with specimen discs, the vernier knurled knob being used to secure just enough capillary attraction to prevent the specimens from escaping over the edges of the slide.

Such a collection is known as a culture. A knapsack for carrying a number of bottles will be useful, though not at all essential.

Returning to your home laboratory, replace the corks of all bottles with squares of gauze secured around the necks with rubber bands. This admits oxygen to the inhabitants of your cultures and keeps them living and healthy. Those bottles containing greenish water may be placed in sunlight as they contain plants; others should be maintained in a cool and shady place, as on a shelf or table of your workroom.

For examination of these cultures one needs several blank glass slides and a dozen or more cover glasses, supplies which may be purchased from any dealer in microscopes or firm handling biological materials for schools and colleges. Several pipettes, medicine droppers in ordinary language, one or two glass battery jars or quart fruit jars, and perhaps one depression slide will fill glassware needs for the present. A little vaseline and iodine are chemicals of use at this time that are available in every household.

Tie a piece of red string around one of the culture bottles and around one pipette so that the two may be kept together by color association. Or dab a spot of red paint on each, or label each "No. 1" or in any similar manner use symbols to assign a separate pipette to each bottle; it's unwise to mix them up, since one culture may then contaminate another.

Insert the pipette into bottle as far as the top surface of the debris and suck up a bit of this solid matter along with water. With a blank slide on the table before you, place one large or two small drops of culture on it and lower a cover glass into place, held by the edges with the fingers or grasped with a forceps and applied in a slanting position, one edge touching the slide just beyond the fluid, then released, so that it falls onto the culture, causing it to spread out into a thin film beneath.

Mount this slide upon the level stage of

[*Continued on page 122*]

Printing Plates Made With Stencils

by Kenneth Murray

IF YOU have access to either a rotary or hand rocker type stencil printing mimeograph, you can easily make printing plates or "cuts" for use in an ordinary printing press. These are more practical than stencils for long runs and imitate typewriting with greater fidelity.

First, cut the stencil in the usual manner on the typewriter, but in attaching it to the mimeograph, see that it is put on in the reverse of the regular way, or so that copies printed with it read backwards. A fresh ink pad should be used, inked with regular printing ink and thinned with mimeograph ink so that it will just pass through the stencil. With a rotary machine use less platen pressure than with paper, and with a rocker type use very little downward pressure.

First make an impression on regular engravers' polished zinc. If the first trial is not perfect, clean the plate with benzine and repeat. When a perfect copy is secured, dust it with powdered dragon's blood, a red colored engravers' resin. Remove all powder not adhering to the inked lines with a soft camel's hair-brush, then heat the plate until the lines turn to a glossy brown. This forms an acid-proof resistance. The back and edges of the plate must also be protected with asphalt varnish applied with a brush. When the plate is dry, place it in an enameled or

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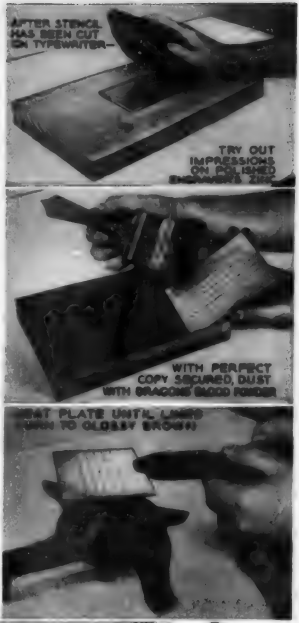
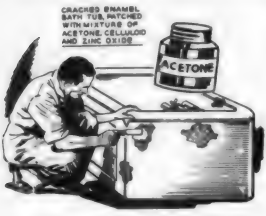


These pictures illustrate the steps required to produce homemade engravings. This method permits excellent typewritten facsimile work to be produced on a regular printing press.

ABOUT-THE-HOME HANDIKINKS



Enamel Repairs Broken Porcelain

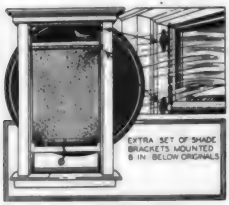
UNSIGHTLY chips in porcelain bathroom fixtures can be permanently hidden by covering them with an easily prepared celluloid enamel. Scrap pieces of celluloid are dissolved in acetone until the solution attains the consistency of paint. A small quantity of zinc oxide is added to provide the color. If other than white is desired, any dry mineral colors may be substituted. Apply the paint to the marred areas with a camel's hair brush. Do not try to fill the chipped area with one coat, but build up the surface gradually.

Bottle Cap Forms Handy Pot Scraper

HOUSEWIVES who are tired of using paring knives and spoons for removing burned foods from skillets, frying pans and other kitchen utensils will appreciate the efforts of the handy man who makes her one of these useful pot scrapers. The scraper is merely a bottle cap fitted to a short handle. For the latter, a length of broomstick is excellent. The cork disc is removed from the inside of the cap and a hole punched in the tin, large enough for the wood screw to pass.

Brackets Stop Window Shade Rattle

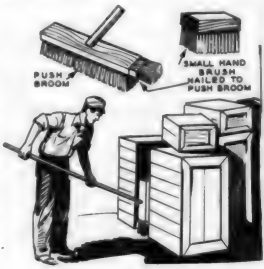
RATTLING window shades need no longer disturb bedroom occupants, for with an additional set of shade brackets the blind can be lowered so as not to be in the path of the circulating air. Secure a set of brass shade brackets identical to those now on the window frame and mount at a point 8 inches below the originals. This spacing will permit the curtain to be attached below the opened window



Snubber Brush Cleans Corners

WHEN cleaning up the basement workshop with a push-broom it is almost impossible to remove dirt that has accumulated in corners. Since this type of broom is much more adapted for shop use than the usual housewives' broom, its inconvenience can be overcome by attaching a small snubber brush to one end so as to make it more versatile.

A small hand brush, with moderately long bristles, is attached to the end of the push broom with several nails. The hand brush chosen should not exceed in length the width of the larger brush.



WHEEL KIT SIMPLIFIES Soap Box Scooter Building

No longer need junior chop up a perfectly good pair of skates in order to secure wheels for his soap box scooter. With this wheel kit he can quickly build a speedy and substantial racer.

SO MANY roller skates are broken up to provide wheels for home-made scooters that a skate manufacturer has finally decided to cater to this need directly, and has brought out truck assemblies designed specifically for roller-scooter purposes. A pair of these can be purchased for much less than regular skates, and are much easier to mount.

Actual construction time spent on the simple, rugged and very fast scooter shown amounted to less than half an hour. The horizontal and vertical members are short pieces of scrap 2x3's, with part of a broom handle screwed to the top to act as a grip. The 45-degree braces at the bottom are merely nailed in place. The wheel units are firmly attached to the underside of the horizontal board by means of ¼-inch bolts.

Wire Guard For Fan Blades

THE potential danger presented by the sharp spinning blades of an electric fan while in operation can be eliminated by fitting the fan cage with a wire mesh guard. For the guard heavy chicken wire may be used. A circular piece large enough to fit over the exposed back is fastened in place by bending the ends of the wire over cage frame. A strip of similar mesh can be placed around the edges of the cage.

A wire mesh guard attached to the electric fan cage protects fingers from spinning blades.

Rope Craft Bird Houses

AN IDEAL nest which will attract many wild birds can be made from ordinary rope found around Japanese orange boxes.

The rope is twisted, or coiled rather, and each coil held by ordinary grocers string, either sewed or tied.

The nest is started at the bottom by first winding a circle and building upwards, tapering off as the nest reaches the proportions required. When the nest is completed it can be stained and then shellacked making it waterproof.

This nest can be used in cages with birds who prefer a closed nest. Its creator states that he has tried hundreds of types of nests but this one is the most satisfactory.

Formed from manila rope, these attractive bird houses make an interesting workshop project.

MAKE THIS EARLY

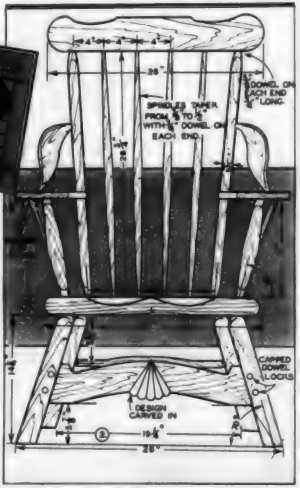
Within the scope of the average craftsman, this maple furniture piece is truly descriptive of the early Colonial period which it represents.

A radiant reflection of colonial design, this sturdy armchair is a project that will excite every home craftsman's admiration. It may be built of either white birch or hard maple. Arm pattern, which should be enlarged to full size, is shown above. Front view at right.

THIS chair should find favor in the eyes of lovers of early American furniture, because of its radiant reflection of Colonial design. Sturdiness, comfort and the mode of construction also bear true resemblance to the period. The sloping seat, comfortable wide spreading arms, and restful back make it a chair of distinction, and one that will give comfort in any home.

The woods most suitable for its construction are hard maple and white birch, but in either case care must be taken in selecting stock of uniform color and grain texture. Start by laying out the arm pattern on heavy paper in conformity with the graph layout, Fig. 1, and then trace on ¾-inch stock. Round the edges and sand each arm. Mark holes, but do not bore until careful alignment is made with seat to determine proper hole slant.

Next, glue up 2-inch stock for seat, the specifications of which are found in Fig. 7. The glue joint should be well doweled close to the lower edge to permit routing seat without striking the pins. Figs. 4 and 5 show method of seat forming. Rough cut with gouge and finish by scraping and sanding. All edges should be round and smooth. Locate and mark holes but do not bore. Then make the

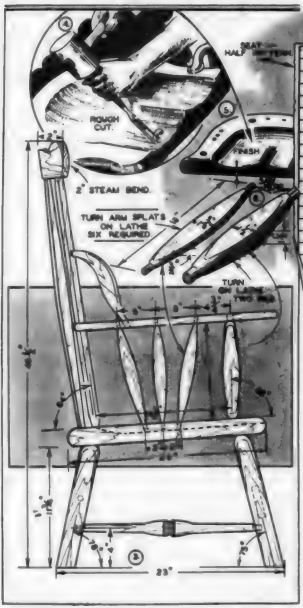


AMERICAN ARM CHAIR

by Oscar E. Olson

arm splats of ¾-inch stock by turning on lathe. The end arm supports are turned from 1½ by 1½-inch stock, Fig. 6. Care in turning must be exercised to make dowel ends of precise size, as shown in drawings, as the rigidity of the chair depends entirely upon close fitting joints. Saw kerfs in upper ends as shown. Coarse sandpaper will aid in cutting taper of splats and arm supports followed by dressing with number 00 sandpaper. The back upright rails are made of 1½ by ⅞-inch stock, and taper somewhat toward the ends

The seat is made from 2-inch stock joined with dowel pins. The seat is roused to shape with chisel and mallet. Finish by scraping and sanding. The arm splats are lathe turned from ¾-inch stock as shown below.



The side plan of the chair shown at left corresponds with the front view detail shown on the opposite page. Rungs, legs and splats are lathe turned jobs.

with ⅝-inch dowels turned above and below. The back spindles are turned from 1 by 1-inch stock and are made with ½-inch dowels, Fig. 2.

For the head plate, select stock ¾ by 4-inch clear, and free from grain run-outs. Lay out as per specifications of Fig. 11, and cut roughly to line before steaming. A pressing form can be made from double 2 by 6-inch rough stock with a curvature of 3 inches, which is 1 inch in excess of desired bend. This provides a leeway for backset. Steam or boil the board until it can be forced into the form with two bar-clamps, as shown in photograph.

Make the winged back according to the above pattern; then bend to shape by steaming and locking in a clamp until dry. Cross plate pattern appears at top left.

All parts should be assembled with extreme care. The cross plate assembly is described above. The ends of the splats are secured to arms by use of wedges.

If there are any indications of the board cracking while drawing to shape, re-steam and press again. Place in a very warm place to dry, and let stand for at least forty-eight hours. Intense heat should be applied at the end of that time by holding over a flame or stove to insure perfect dryness. After removing from frame, dress down all edges and sand over all. Mark and bore holes as shown in Fig. 2.

The wings are made of ¾-inch stock as shown in Fig. 8. The ends are drawn to ⅝-inch size with a spoke shave, and tapered gradually into the wing flare. Round all edges and sand smooth.

The legs are made from 2 by 2-inch stock with turned 1 by 1-inch dowels, Fig. 12. The taper is made by rounding the corners and dressing with sandpaper. Do not attempt to bore holes for the rungs until the proper angle has been determined, which will be after the leg has been fitted to the seat.

Next turn the three rungs, following the measurements in Fig. 12. Graphed dimensions for the lower cross plate are shown in Fig. 9. The carved fluted design in the center involves only straight cuts, and is quickly made with a saw and a chisel. The end tenons had best be cut later to conform with any possible discrepancy that might arise in boring the leg holes.

Now that all of the parts are cut, we are ready for the assembly. Study carefully the slants of the various parts, particularly of the legs, as shown in Figs. 2 and 3, and bore each hole with care and precision. First fit the legs to the seat and check slant; then mark and cut tenons on cross plate, followed by cutting mortises in front legs. Next mark and bore holes for cross rungs. Then glue the

[*Continued on page* 128]

PAPER
MAGIC
CUT ROLL OF PAPER
PULL UP FROM CENTER TO FORM FIR TREE
FOLD OVER FLAPS
BEND OVER TO THIS SHAPE
FIRST CUT ROLL OF PAPER
PULL AT CENTER TO FORM LADDER
A fir tree or a ladder can be made easily by following the simple directions. To make the fir tree, cut three vertical slits outward from the center of a roll of paper. Take hold of the center turn and pull until the paper is made by cutting the paper as above and pulling the top rung upwards. Fasten bottom with an elastic.
START WITH SQUARE SHEET OF PAPER
FOLD OVER IN MIDDLE
FOLD EVENLY AGAIN—NOW FORMS SQUARE
UPPER LEFT HAND CORNER WILL HAVE NO FOLD
FOLD INTO TRIANGLE
TEAR OFF THIS CORNER
FOLD AGAIN AT THIS LINE
LAST FOLD
TEAR AWAY WHITE AREA, PLUS POINT—UNFOLD
RESULT
DECORATIVE PATTERN
A simple but highly amusing trick is that of making interesting designs from paper. A few folds, and tears and the sheet of paper takes on the pattern of a lace doily. The larger the paper, the more intricate may be the design.
CUTTING FOLDING TAIL OR NECK STOCK FROM 1 TO 2
START WITH 9" WIDE STRIP OF PAPER AND THE KNOT IN IT
DRAW IN FACE
BEND TAIL OVER
TUCK IN
THE FINISHED PAPER HEAD
To make a face with paper, start at Fig. 1 by tying a knot in the end of a strip of paper. Then proceed as in the sketch with the scissors and pencil in the right hand, performing very much as in the face and neck cutting very much as in the face and neck cutting very recently. This is one of the tricks requiring very little skill on the part of the performer.
PAPER ABOUT 2" X 13"—FOLD ON 2 OUTSIDE LINES—TURN OVER AND FOLD ON NEXT 2 ETC
SOME OF 70 OR 80 SHAPES INTO WHICH PAPER WILL FOLD
WILL LOOK THIS AFTER FIRST FOLDING
BY BENDING BACK SIDE FOLDS MANY OTHER FIGURES CAN BE MADE
START AT LOWER EDGE AND FOLD BACK AND FORWARDS INTO PLEATS ABOUT 1/2" WIDE AS IN 3 AND 4
LAY OUT TRIANGLE ON SQUARE OF PAPER
CUT ALONG THE FULL LINES SHOWN. DISCARD CDE. HAND OUT REMAINING PIECES TO BE FORMED INTO A TRIANGLE; IT WON'T OCCUR QUICKLY TO ANYONE TO ENCLOSE A TRIANGLE
At the right is shown the layout for a puzzle triangle. On a piece of square paper trace the lines as shown. Cut along the lines and discard the triangle CDE. Above is shown one of the many designs which may be made by folding and bending sheets of paper. By following the simple directions, no trouble should be experienced.

Animated Jumping Horse Is Interesting Toy Project

Pulled across the floor, this mechanical horse leaps across the hurdle with its jockey. The toy is simple to make, requiring only scrap pieces of wood which are cut to shape with a hand scroll or power jig saw.

The ambitious shopman will find this toy a profitable gift project. Cost, including paint, is under 10c.

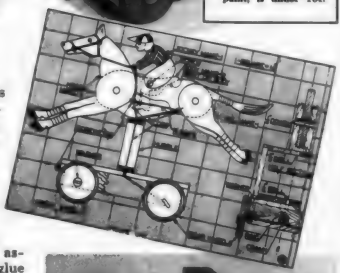
by Ralph T. Moore

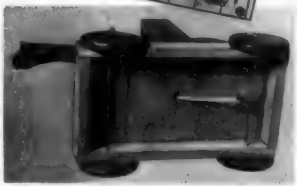
FOR the child who likes animal toys this galloping bronco with his attentive jockey will supply no end of fun and all he requires is that he be pulled across the floor.

On ⅜-inch plywood lay out the patterns for the head, tail and two body pieces of the horse and also the jockey. Cut these out on a jig saw or, in the absence of this, a coping saw will do nicely. Sand the pieces smooth and drill assembly holes with a ¼-inch drill. Now glue in place a 1-inch length of ⅛-inch dowel in the two holes in the *"Head"* and *"Tail"* pieces, allowing the dowel to extend evenly on each side. Drill the jockey with a $\frac{1}{16}$-inch drill and countersink the hole, insert a small screw-eye in the end of the jockey's arm and similar screw-eyes in the head and tail pieces.

The *"Hurdle"* is next and this is constructed of ¾ by ⅜-inch stock. The top piece of this unit is not at once nailed to the hurdle. Cut out the frame for the base next of ¼-inch stock, the top being of plywood. The four wheels are next and these may be turned out on a lathe or cut out and sanded. The two

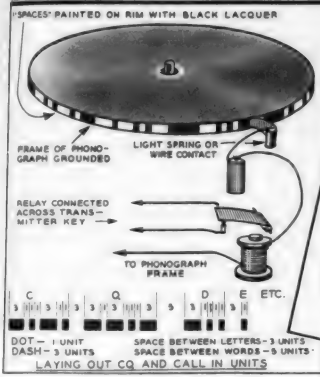
[*Continued on page* 138]





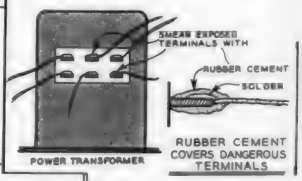
Details of construction are shown in the above pattern. Each square in the pattern is equivalent to 1½ inches. All parts are of plywood or ¼-inch pine stock.

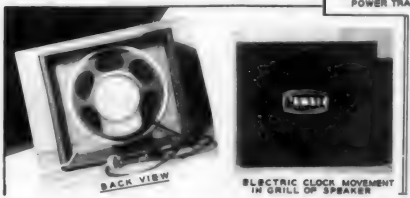
RADIO SPARKS



The simplest, cheapest and most practical code practice set for the beginner consists of a buzzer, key and batteries. This is almost as good as a tube oscillator and has the advantage of being heard by a group of listeners. To give the buzzer a high note simulating a CW signal, push a match stick wedge between the armature and the vibrator spring. Both the buzzer and batteries are obtainable from the 5 and 10-cent stores.—W2GLP, Alfred Dolid, Long Island City, N. Y.

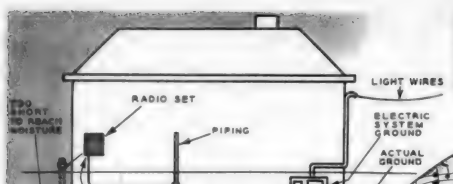
For the ham who wishes to save wear and tear on the wrist, this automatic CQ machine will do the trick. To place it in use, it is necessary only to turn on the switch and let the machine do the rest, cutting in occasionally to listen for a call. The diagram is self-explanatory. Be sure to paint the space between the dots and dashes. The characters should appear on the edge of the turntable in the form of spaces between the paint.—W1JKX, J. R. Mack, Springfield, Mass.





In a radio transmitter there are many terminals and soldered joints which should be covered with some type of insulation to prevent shocks when making adjustments. When the set is completed, a small amount of rubber cement applied to all "live" parts will give effective insulation. It is easily removable.—L. B. Robbins, Harwich, Mass.

A combination radio loud speaker and electric clock is useful in any experimenter's "shack." The grille of the speaker is cut out with a hack saw to take the escutcheon of an electric clock movement of the direct reading type. Just behind the clock is mounted a false grille made of prestwood, to which is mounted the speaker cone. The inner grille is held in place by small brass "L" brackets in the corners. The wires for the clock are pulled through a hole in the speaker board. It was found that the clock did not interfere with the tone of the speaker.—W2PZ, Frank Frimmerman, Bronx, N. Y.



Left—In cases like this, it is difficult to select the correct ground. The most satisfactory method of making a selection is by trying both. The one giving the louder signal with the least noise is the one to use. In most cases the ground used by the house electrical system is unsatisfactory.

Circle — A valuable though inexpensive piece of equipment for insuring a good ground connection. Before attaching this ground clamp, be sure the connection is very clean.

THE NEGLECTED GROUND CONNECTION

ALMOST any ground connection for the radio receiver—or none at all—will do when one listens only to stations within twenty or thirty miles, but a good ground is a great help in lifting out-of-town and foreign stations out of the "background." This applies just as strongly to short waves as to long waves, nor is there any exception for those sets which are connected to "antinoise" antennas.

What is a good ground connection? A portion of the answer is supplied by the accompanying sketches, and some more of it by the following paragraphs, but the final answer must be found by means of an extremely simple experiment at a cost of about ten cents.

How To Test Ground Connections

An engineer tests ground connections by measuring them, and I could clutter this story up with a lot of funny-looking curves and tiresome figures from my laboratory notes, but this would do much less good than your own experiment which requires only a trip to the store for a coil or spool of small copper wire. Sizes down to No. 26 are useful for this temporary purpose, and the insulation does not matter. If there are scraps of

An excellent substitute for a good ground. This is especially suitable in locations where a good ground is almost impossible.

wire about, they too will serve as long as they are joined up by joints well scraped and hard-twisted. The idea is simply to run one wire of some sort to each ground which might be some good at your home. However, do NOT connect them all to the receiver. Simply bring them to it and have them all

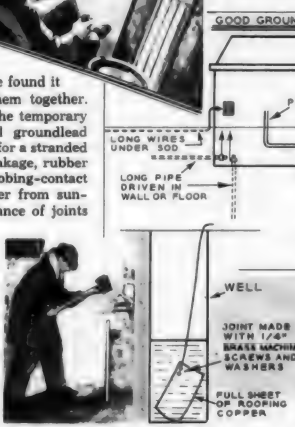
handy at the same time. Then tune in a rather weak station which is not being interfered with and is not fading rapidly and try the ground wires one at a time. The best one gives a better signal, less noise, or both. Be sure to test on several shortwave and longwave stations before deciding. If a station fades too badly another may be better. Anyone can get good results from the experiment if the family is quiet or goes to a movie for the evening.

If two fairly good grounds are found it may be worth while to try them together. The best being found, discard the temporary thin wires and run one good groundlead which will stay good. This calls for a stranded wire of fair size to prevent breakage, rubber covering to prevent loud rubbing-contact noises, braid to keep the rubber from sunburning, and a complete avoidance of joints made with rivets or clips. Soldering will do, but I prefer ¼" brass machine screws with brass washers. If a ground clamp is used it must be of copper, and much heavier than the usual telephone or radio ground. The telephone company can use such because their relatively high-voltage ringing current gets through even a failing connection, and their tests disclose one that has failed. It is another matter for weak radio signals. Proper clamps an inch wide and equipped with strong screws are sold by electrical dealers. Window leadin strips are mostly bad. If good ones can't be had, at least solder over all clipped or riveted joints. This is good for the antenna leadin too.

How To Choose Ground For Testing

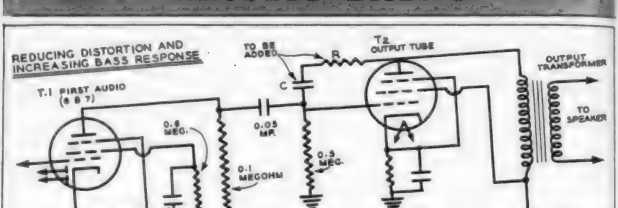
The cart is now far ahead of the horse; it is time we started choosing some grounds for testing. A very long ground connection is always dubious. Thus a top-floor apartment-house dweller must choose between poor grounds. The water piping, gas piping, heating system, electric light system and telephone wires are all very lengthy, besides being so tangled together that they are all noisy together. The least worthless one may be found by the test method already described, but at any height above the fourth floor the results are not usually happy. There are two good grounds for

[*Continued on page 120*]

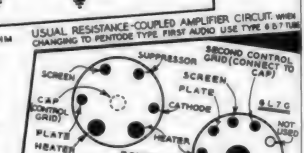


Examples of good grounds. Long pipes driven through the wall or floor are one of the best forms of ground for the average radio fan. When a well or cistern is available, a good connection may be made at these points. In all cases be sure the actual connection points are bright and clean.

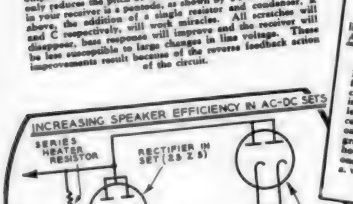
RADIO CIRCUIT SHORT CUTS



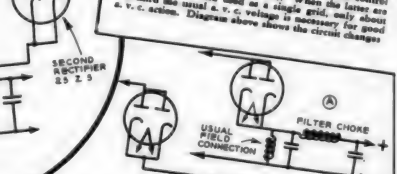
Many receivers employing pentode type output tubes sound tinny and scratchy. Attempts to reduce this annoying sound by using a large by-pass condenser across the primary of the output transformer may fail, because the large condenser easily reduces the pitch of the scratch. If the first tube audio in your receiver is a pentode, as shown by T1 in the diagram above, the addition of a single resistor and condenser, R and C respectively, will work miracles. All scratches will disappear, bass response will improve and the receiver will be less susceptible to large changes in line voltage. These improvements result because of the reverse feedback action of the circuit.



In rural sections, radio signals may not be strong enough for good automatic volume control action. In such cases, it may be desirable to replace one of the I. F. tubes in your receiver with a type 6L7G or its metal equivalent, the 6L7. The 6L7G has five grids. Two of them connect together internally and constitute the screen; one suppressor connects to the cathode; and two control grids are available for outside use. When the latter are hooked together and used as a single grid, only about a v. c. action. Diagram above shows the circuit changes



A simple way to increase the efficiency of the loud speaker in AC-DC sets is to use two rectifier tubes instead of one, connected as shown in the above hook-up. The series heater resistor should be reduced in order that the proper heater voltage be maintained at the tubes. It should have a value of 100 ohms if the receiver has five tubes, 75 ohms for six tubes, 55 ohms for seven tubes, and 35 ohms for eight tubes. The new rectifier is included in these figures. This "kink" will make the set sound much better than before.



In most AC-DC sets, the field coil is connected directly across the output of the rectifier, as in A, above. A new type speaker just placed on the market is designed to replace the choke coil and is connected as in diagram B. A valuable feature of the new connection is the increased voltage obtainable on the power output tube; this results in more power output. With the old connection, the plate voltage on the output tube was decreased by the bias voltage. The new speaker permits bias voltage to be obtained from the field winding.

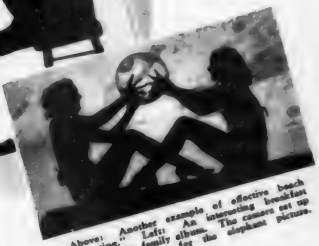
MODERN PHOTOGRAPHY

How To Take Silhouette Pictures

The colored camera department is intended to help you make better photographs. Tell us what your problems are; your questions will be answered by practical experts.

A beach picture that is different! Taken directly into the sun late in the afternoon, with the camera held low.

With an elephant cut from cardboard and the camera set up as per the diagram above, a really tricky picture is easily obtained.



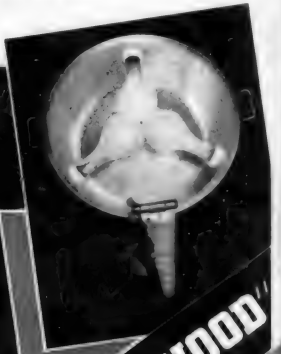
Above: Another example of effective beach "shooting." Left: An interesting breakfast scene for the family album. The camera set up was the same as for the elephant picture.

NO WINTER season of picture-taking is complete unless you have made indoor silhouette pictures and tested your imagination and ingenuity in devising interesting scenes and poses.

The essential set-up is merely a sheet stretched tightly across a doorway between two rooms, a photoflood or photoflash bulb in a floor lamp in one room, and your subject and the camera in the other room. A little experimenting with exposures will be necessary. As a starter, try about one-half second at f. 6.3 with fast panchromatic film, if one flood bulb is used. With a flash bulb, use the "B" or bulb setting, and keep the shutter open only long enough to record the flash. A tripod for the camera is also advisable to prevent blurring.

"Props" cut out of shirt cardboards offer unlimited opportunities for clever and amusing pictures of many kinds.

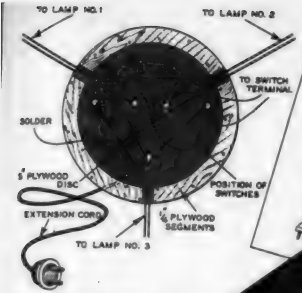
ENOUGH light to take snapshots indoors with an ordinary camera is provided by this powerful photographic floodlight. Three No. 2 photoflood bulbs in an aluminum reflector give an illumination equivalent to that of forty-five ordinary 100-watt bulbs, yet you can plug the unit into any ordinary 110-volt A. C. or D. C. line; truly you get Hollywood results with minimum equipment. With this floodlight at hand, your pictures need no longer have that stiff, posed effect so common with indoor time exposures. You will be able to catch those interesting but elusive expressions which children and pets seem to assume only when at perfect ease in their own home.



The floodlight requires only three simple materials costing less than $1. The completed light is shown at upper right.

BUILD This "HOLLYWOOD"

This super-power photo-floodlight uses a dish pan for a reflector. It costs only $2 to build.



The switches are attached to a 5-inch plywood disc and wired as shown in these schematic and pictorial details.

FLOODLIGHT for Indoor Snapshots

by L. J. Markus

The back of the floodlight is shown in the illustration at right. Note the neat wiring provided by the plywood disc. Wiring should be with heavy cord only.

The floodlight can readily be clamped to any chair, door or other piece of furniture of the desired height with not the slightest danger of marring a fine finish on the wood; this feature eliminates the usual wobbly music stand or cumbersome heavy tripod, and in addition gives a floodlight for which room can be found even in a one-room apartment where storage space is decidedly at a premium.

The six-hour rated life of the photoflood bulbs can be stretched into many months by the ingenious switching circuit which is used. While focusing and arranging the scene to be photographed, you can operate the bulbs all in series and still secure more than ample illumination. Then, just before you are ready to snap the picture, flip over the switches to put all three bulbs in parallel and secure maximum illumination. Another flip of the fingers after the picture is taken and the lights are back in series again, in which connection

[*Continued on page* 140]

Electrical fixtures are completely independent from the dishpan reflector. The screw-ring porcelain sockets and plywood disc can be removed from the reflector in a few minutes should replacement of dishpan be necessary.

"Daylight" Tanks Made From Chemical Bottles

by Merle Terrill

Made from 1-pound chemical bottles, daylight developing tanks like the one pictured here make useful accessories for the amateur photographer's darkroom.

THE cost of "daylight" developing tanks in which cut films or film packs can be developed, fixed, and washed in daylight, after being loaded in the dark, makes them a luxury for most amateur photographers. However, if square or flat shaped bottles are obtainable, small daylight tanks, that will hold from two to four films, can be made at a cost of only 15 or 20 cents for each tank, or less than one dollar for a half dozen tanks.

The tank described here was made from a 1 pound sodium bisulphite bottle, holds four films and requires only 12 ounces of solution. To make such a tank, first cut off the top of the bottle by scoring it with a glass cutter. Smooth off the sharp edges of the glass with a whetstone and wind strips of wrapping paper around the top. Allow the paper to project ½-inch above the glass, building up a layer ½-inch or more in thickness and then dip in melted parafine to waterproof and seal it. After the wax has cooled, trim off the top of the paper with a razor blade to a flat, even surface.

[*Continued on page* 136]

The neck of the bottle is cut off and rough edges smoothed with a whetstone. The lid is cut from plywood and fits into the lip formed from strips of heavy wrapping paper. Paint outside of bottle black.

"STOPPING" Your Picture Failures

With the lens at f. 4.5, and the camera focused on the extreme left magazine, the other two copies are badly blurred.

With the lens still at f. 4.5, and the camera focused on the rear-most magazine, the front two are blurred.

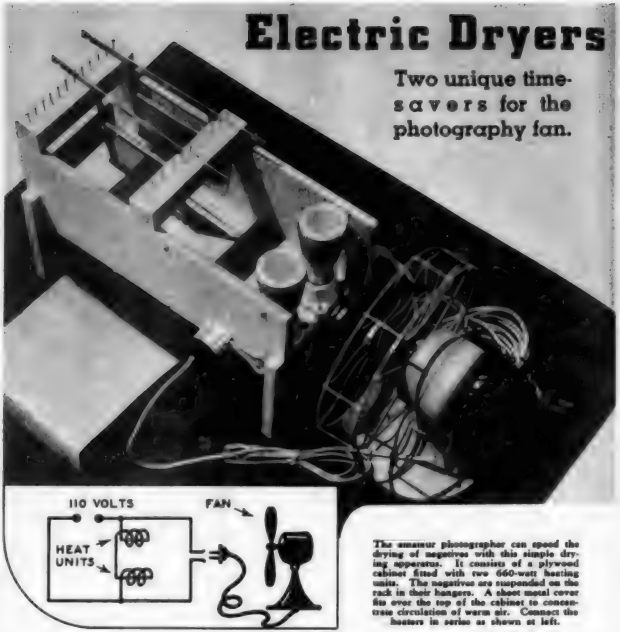
The lens has been stopped down to f. 32, and all three magazines are now sharply in focus.

MANY picture failures are due to incorrect adjustment of the lens diaphragm and to careless focusing of the camera itself. It is true of all lenses that the "depth of field"—that is, the area of sharpness—is small at large openings and large at small openings. Therefore, it is a safe plan to "stop down" the lens diaphragm if you are doubtful about the focusing. This will compensate for small discrepancies and will enable you to obtain a sharp picture of the subject you are "shooting."

The accompanying pictures graphically illustrate the effect of large and small "stops." Three copies of MODERN MECHANIX were set up in a line a foot apart on a table top and photographed with a 9x12 cm film pack camera at distance of five feet. With the lens at its full opening of f. 4.5, the depth of field is very shallow—hardly more than a few inches. Only with the lens closed all the way down could all three magazines be photographed clearly.

Electric Dryers

Two unique time-savers for the photography fan.



The amateur photographer can speed the drying of negatives with this simple drying apparatus. It consists of a plywood cabinet fitted with two 660-watt heating units. The negatives are suspended on the rack in their hangers. A sheet metal cover fits over the top of the cabinet to concentrate circulation of warm air. Connect the heaters in series as shown at left.

AMATEUR photographers would do well to take a hint from the professional when it comes to methods of saving time, especially in darkroom work. Even if photography is only a hobby to you, some of it can be drudgery causing the waste of many hours that can be better spent on the more interesting phases of photographic manipulation.

Considerable time can be frittered away over the course of even a few weeks while you are waiting for films to dry on humid days. To avoid this, the amateur can easily afford to build an efficient film dryer that will finish a batch of films every 10 minutes, regardless of the atmospheric conditions.

And if you are trying to make your camera pay its way and you need perfectly ferrotyped prints to send to various publications, you need not fill up your ferrotype plates with prints and maybe wait for hours for the prints to reluctantly dry.

For a very small sum an electric ferrotyper can be built that will produce a perfect 8x10, or its equivalent in smaller sizes, every four minutes. With an electric film dryer and an electric ferrotyper you are equipped to gain a lot of time for the more interesting phases of photography.

The first unit to construct is the film dryer. It is really a box, open at both ends, through which air is forced by an electric fan, past two heating units and then past the films, which are suspended in the same hangers in which they were developed and fixed. The

Speed Photo Finishing

by Everett Rudloff

Glossy prints can be quickly dried, even on damp days, when this electric forcetyper is used. Its interior is shown here with the four 660 watt heaters.

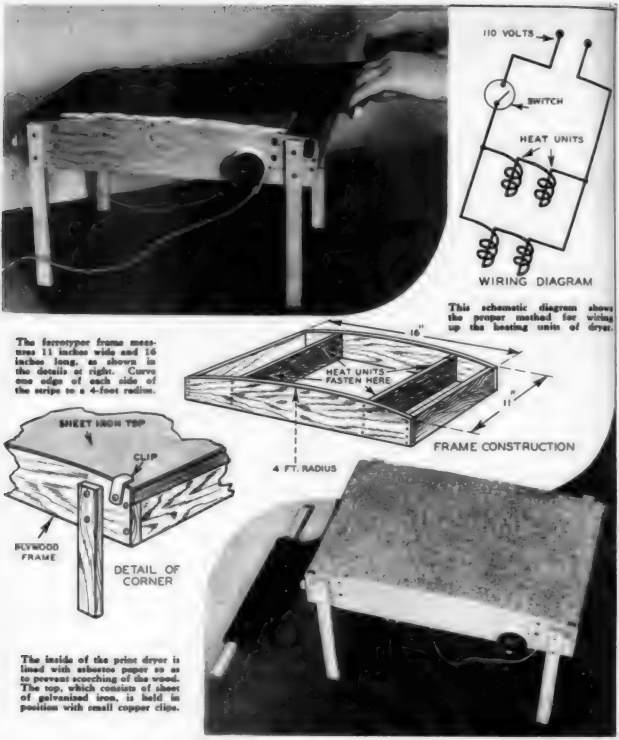
actual size of the box is governed by the size of the film hangers to be used. The box is carried by four legs, screwed to it at a height that will place the open end of the box at the right place for the current of air to blow straight through.

The accompanying photographs show the constructional details of the dryer. In them may be seen the two heating units in place, the receptacle where the fan is plugged in the line, the blocks of wood that carry the film hangers, the nails in these blocks that keep the hangers from bunching together in the fan blast and the metal cover which goes over the heating units.

The heating elements for the dryer consist of two 660 watt units connected in series

This illustration shows the print dryer in use. The squeegee plate is laid on the top of the dryer, face up, with the prints in position. A cloth band draws prints down flat.

The illustration at right shows the negative dryer in operation. A cleat type socket mounted on the side of the cabinet permits the electric fan to be disconnected when it is not needed.



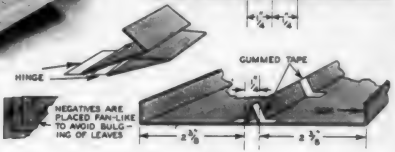
across the line, with the electric fan connected in parallel. A receptacle is provided for the fan so that it can be instantly attached and detached as it is not incorporated permanently in the dryer.

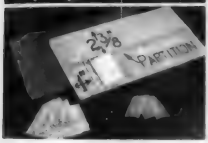
To use the film dryer connect it with the house current, wait five minutes for the heating elements to heat up sufficiently and then connect the fan. Put the wet films in the space provided for them and allow to dry thoroughly.

In order to subject the films to the high temperature without damage it is necessary to immerse them in a formalin bath after washing. This is a 10 per cent solution of formaldehyde and water. The films are left in this solution five minutes, then sponged off. The formalin solution hardens the film, not only so it may be dried in reasonable heat, but so that it will resist scratches after processing.

[*Continued on page 124*]

CAMERA KINKS





NEGATIVE FILE

To make this convenient negative file, the writer used a handkerchief gift box, divided in the center by an inverted V section of stiff cardboard. The dimensions given are for the popular "half yoot pocket" negatives (1¼x2½"), but of course can be changed to suit other sizes. Ordinary 3x5" office file cards were used for the flaps, which are hinged by strips of gummed paper. Each pocket holds 16 negatives without bulging, the capacity of the whole box being 704 negatives. The titles of the negatives are written on the edges of the flaps. Shutter speed, lens opening, type of film, light conditions and other data can be written in an abbreviated code on the overlapping portion of the flap. Exposure time and kind of printing paper can also be indicated; this information will be especially useful when duplicate prints are to be made in the future.—Anthony Ganca.

ANNOUNCEMENT CARD

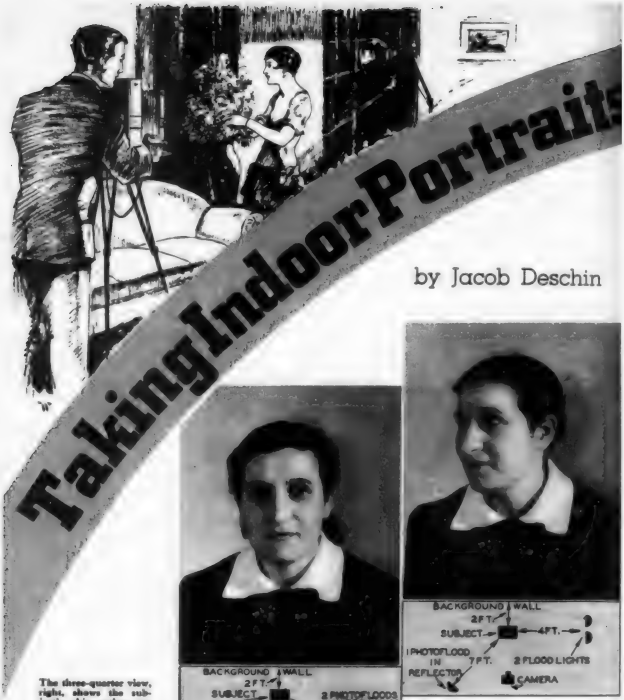
This novel birthday card is easily made. First the picture of the baby was taken. A print was burned around the edges and pasted on a 7x10 inch card. The announcement was lettered on the card and the latter then photographed. Prints were made on one half of post-card size paper and folded in half to fit small envelopes.—Wm. R. Ross.

INCLINING THE CAMERA

In the absence of a regular tilting tripod head, a standard three-leg tripod can be adjusted for angle shots very easily. Simply pull one of the legs between the other two as far as it will reach, as the picture above shows. The tripod is then perfectly stable and the degree of tilt can be controlled by raising or lowering the forward leg.—Duane Featherstonbaugh.

DARKROOM SEAL

If an existing room with an ordinary door is selected for a darkroom, the edges must be sealed to keep out stray light. The photo on the left shows how doubled lengths of black cloth, tacked around the door, serve this purpose.—A. Dolid.



Taking Indoor Portraits

by Jacob Deschin

The three-quarter view, right, shows the subject's chin rather too prominently. The head-on view, left, conceals it and is a more flattering portrait. The diagrams show the placement of the lights.

IT'S easier to make miniature camera portraits outdoors by daylight, but you can get a wider variety of effects and make better portraits by using artificial light indoors. The idea is simply this: In order to show the entire face, both sides should receive sufficient light to reflect to the lens and thence through to the film emulsion.

If this were all, it would be very easy to illuminate your subject so that both sides would be lighted equally and the result would be a "flat" picture, one which showed little contrast in the face. This is the kind of portrait by artificial light that is all too prevalent among amateur attempts and which has discouraged many from any further picture-taking in this field. However, the way to avoid this flatness and consequent lack of pictorial interest is within the abilities of every one willing to follow a few simple rules.

The basis of all good photography is a good range of tones from high-lights to shadows

With Small Camera

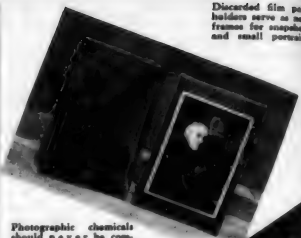
Left pair: The head-on view, while it has an interesting highlight on the cheek bone, is merely a conventional "shot." Note how much more character the picture on the left possesses.

Bottom pair: Posing the lights on one side of the subject gives a heavy shadow, as the right picture shows. A less contrasty effect results from the use of a third light, as indicated at the left.

so that the final photograph will give at least a fair interpretation of the shape, contour and form of the subject's features. In portraiture you achieve this result by using one relatively strong light and one relatively weak light, or the equivalent, lighting one side of the face with the strong light and the other with the weaker light. However, this is a general rule and is offered here merely in order to set down the fundamentals of correct lighting for portraiture. When you come to "effect,"

[*Continued on page* 135]

Tips For The Amateur Photographer



Discarded film pack holders serve as neat frames for snapshots and small portraits.

Photographic chemicals should never be compounded inside the darkroom, as a matter of cleanliness. A group of shelves mounted outside the darkroom as pictured at left, provides an excellent arrangement.

Printing and enlarging failures are eliminated with this time delay switch, designed especially for photographic application. The switch may be adjusted so as to remain on for intervals ranging from one to sixty seconds. Upper right—Promising of individual quantities of developing powers saves considerable darkroom work. Right—Photographic bookplates can be made by first drawing the design, in india ink on tracing paper, and printing as you would a negative. Resulting negative print is then used with long exposure to secure positive copies.

You're Always Near

Autumn Fun Spots

when you ride a HARLEY-DAVIDSON

GO where there's lots of fun — on a Harley-Davidson. Join the other happy riders on their runs, tours, and other club activities. Ride out and enjoy all the beauties of Autumn, be with good pals—go at surprisingly low cost! That's because Harley-Davidsons are built for economy riding. Yes, Siree—motor improvements give greater sustained horsepower that cut gas and oil costs WAY DOWN. And you'll get added thrills over the Harley-Davidson's streamlined design, snappy color combinations, and smooth, gliding speed. Why WISH you had a Harley-Davidson. OWN one now!

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My age is ☐ 16-19 years, ☐ 20-30 years, ☐ 31 years and up, ☐ under 16 years. Check your age group.

AMATEUR PHOTO PUZZLERS

In this department the Photography Editor will answer any question or problem relating to cameras of all types, enlarging, printing, developing, taking pictures, and the various phases of home movie making. When sending questions to this department, be sure to include a stamped, addressed envelope, so that we can answer directly as case space does not permit publication of the question on this page. Send all inquiries to the Photography Editor, Modern Mechanix, 1501 Broadway, New York, N. Y.

"STOPPING" DEVELOPING OF OVEREXPOSED FILMS

Recently I processed two exposures from a roll of snapshot film, but to my dismay found that the film had been overexposed. Is there any way by which I can retard the developing of the remaining film so as to secure satisfactory prints?—Oscar Klove, Elizabeth, N. J.

Negatives which develop almost immediately after being placed in the developing solution indicate that they have been overexposed. To "stop" the chemical reaction on the film emulsion add a 10% solution of potassium bromide to the developing solution. Only a few drops will be required to produce the desired effect. It should be understood that the addition of this chemical will not give perfect results, but it will aid in securing fair results from an otherwise ruined negative.

There are two common causes for negatives being flat or fogged. Developer containing too much alkali, namely carbonate of sodium or potassium, will tend to produce poor negatives. In your particular case, though, we believe that the trouble was due to the developing solution being too warm. When working in the darkroom during hot weather keep the temperature of your developer down to normal. Warm developer will often fog negatives. To prevent this, place several ice cubes in the tray. For small trays one cube will be sufficient to keep the temperature at normal.

HOW TO CLEAN A CAMERA LENS

What method would you advise as best for cleaning the lens of a 4x5 plate camera? This camera has been in my possession only a short time, having been previously stored in an attic for several years.—Arnold Wilbur, Austin, Texas.

Unless the lens is exceptionally dirty and shows deposits of grime which cannot be easily removed, it should be cleaned by lightly brushing over it with a very soft camel's hair brush. If dirt has collected on the inside of the lens remove the plate holder, dust out the bellows and finally brush off the particles which have collected on the inside of the lens. In the event that the lens still remains dirty, purchase a small bottle of lens cleaning fluid, which costs only a few cents, and carefully follow the directions on the label. At all times wipe the glass surface very gently, to prevent scratching or other injury.

CAUSE OF FLAT AND FOGGED NEGATIVES

During the recent spell of hot weather I experienced very disappointing results with my amateur photo developing. The negatives after receiving the usual chemical treatment proved flat and were, in several cases, foggy. I cannot understand the cause for this since in previous work excellent results were obtained following the same developing procedure. Have you any suggestions as to the cause of my trouble?—William Z. Barth, Oklahoma City, Okla.

APPLYING BLACK BORDERS TO PRINTS

In glancing through the photo album of a friend I saw a group of professionally made prints that struck my fancy and would like to make similarly decorated prints if you can furnish me with particulars. The prints in mind were decorated with a black border trim about 1/32-inch wide extending around the edges. Can you tell me how I can duplicate this effect?—Dan Sidney, Cleveland, Ohio.

Black edged prints are made by trimming away all surplus transparent film from the negative and placing in the printing frame fitted with a mask that has an opening just slightly larger than the negative. Center the negative so the spacing between it and mask is uniform and print in usual manner.

ENLARGER LIGHT SOURCE

I am building an enlarger. Would you advise me to use condensing lens or not?—A. Barnes, L. I. City, N. Y.

With the papers and light sources now in use, condensing lens are no longer necessary to secure sufficient illumination for reasonably short exposures. We suggest the use of a photoflood bulb, a reflector the surface of which has been covered with matte aluminum paint, and a single sheet of opal glass a distance of about one inch above the negative carrier.

AMATEUR PHOTO ODDITIES

Taking photographs under water is by no means an easy task, but the picture shown above indicates that it can be done. This snapshot, taken by Willis Straw of Ocala, Florida, received this month's $5 award. The novel photo below it produces the effect of a giant straddling a midget. Actually the smaller figure was standing at a considerable distance from the subject in the foreground. For this effort, Joseph Rozak, E. Newark, N. J., received the $3 amateur award.

MONEY FOR YOUR BEST PICTURES!

Beginning with the November issue, the "Amateur Photo Oddities" section will be enlarged to a full page, and we will pay $15 for the most unusual photograph received from readers, $10 for the second choice and $5 each for the next three selections. Get busy with your cameras and send in your pictures now!

Just what a modern camera ought to be

LENS . . . The new super-precise Kodak Anastigmat Special *f*.4.5.

SHUTTER . . . Compur-Rapid, 9 speeds to 1/400 second.

* * *

For other lens and shutter combinations for Kodak Specials, see listings at right.

Kodak Special Six-20—a long step forward in compactness, completeness of equipment, ease of handling, picture-taking ability

THE new Kodak Special anticipates tomorrow in every feature that makes for superlatively fine pictures taken with a minimum of effort.

Your lens may be the new Kodak Anastigmat Special *f*.4.5; shutter, a Compur-Rapid. Advanced refinements include folding eye-level finder, body shutter release, one-finger bed release for quick closing. Case and back, aluminum; covering, pin-seal grain leather.

KODAK SPECIAL SIX-20, for pictures 2¼ x 3¼ inches: with Kodak Anastigmat Special *f*.4.5 lens, 1/400 Compur-Rapid shutter, $45; with Kodak Anastigmat Special *f*.4.5 lens, 1/200 Kodamatic shutter, $37.50; with Kodak Anastigmat *f*.4.5 lens, 1/200 Kodamatic shutter, $33.

KODAK SPECIAL SIX-16, pictures 2½ x 4¼ inches: Kodak Anastigmat Special *f*.4.5 lens, 1/400 Compur-Rapid shutter, $48.50; with Kodak Anastigmat Special *f*.4.5 lens, 1/200 Kodamatic shutter, $41; with Kodak Anastigmat *f*.4.5 lens, 1/200 Kodamatic shutter, $36.50. Eastman Kodak Co., Rochester, N.Y.

(A) Ingenious new body shutter release. You hold the camera firmly in both hands, sight through the optical direct-view eye-level finder, and release the shutter with a light touch of the finger. Camera movement is minimized; you get the picture from eye level at the instant it's "right." Regular exposure trigger is retained.

(B) Optical direct-view eye-level finder; opens with a quick flip of the finger; folds flat to camera body when not in use.

(C) Press this button, and the camera pops open—pull down the bed and the lens snaps out into picture-taking position.

(D) Knurled knob speeds film winding. A big help when shooting a series of pictures in rapid-fire succession.

(E) The one-finger bed release, another new camera feature, which allows the camera to be closed in one quick, simple operation.

ONLY EASTMAN MAKES THE KODAK

New KODAK SPECIAL SIX-20

Car Overhauled After Trip

[*Continued from page 84*]

unwelcome grease will "cook" into a sticky consistency, causing the shoes to cling to the drums. Brakes may stop the car, but since the shoes then do not release fully the constant dragging has the effect of excessive loss of engine power.

When the car is jacked up by its frame so that the rear wheels are free it should be possible to rotate them by turning the drive shaft by hand. Here is where any excessive resistance is quickly noted. If the car has an enclosed drive shaft simply remove all the spark plugs (to relieve compression), place the gears in high and hand crank with the ignition switched off. Any excessive backlash in the universals will be revealed by this simple test. To remove such backlash the universal bushings or bearings should be replaced. Flexible joints should be replaced even if they seem to be working well enough, assuming the car has seen considerable service.

One warning of a bad state of affairs at the universals is a type of front wheel shimmy which has been definitely proven to have nothing to do with the condition of the wheels, tires, front wheel bearings, shackles, springs or steering assembly. Worn universals allow the propellor shaft to whip. This, in turn, sets up vibration which will make the best of front ends go into a bad shimmy in the higher speed bracket. Such whipping also wastes power.

The situation at the rear end, if of the conventional pinion and ring gear type, is detected by the "ear test". Allow the car to coast along the road after attaining a speed of around 30 miles per hour. If there is a loose, jerky motion in the rear, accompanied by a grinding noise, the drive pinion and the driven bevel ring gear are too loosely meshed. An excessively tight mesh is indicated by constant singing or humming noises which increase with speed. Excessive backlash is due to a heel contact of the gears. Toe contact causes excessive decrease in backlash, a condition which may result in a gear tooth chipping. If the pinion gear is adjusted too far back we get a flank contact, resulting in grinding noises and too little backlash. A partial face contact results from the pinion gear being moved too far forward. This increases backlash and the tendency toward breakage of the gears.

Service men double check all this by removing the gear cover plate, removing all the lubricant, cleaning the gears thoroughly and then by painting a number of the ring gear teeth with a mixture of powdered red lead and light oil. With the car jacked up and the engine powering the rear end, using first high gear and then reverse, the paint will clearly reveal the nature of the tooth contact.

Lubrication is the most important consideration with hypoid rear end gears. Such gears do not differ much in principle from the ring gear type except that the pinion meshes with the ring gear at a point considerable below the center of the latter. This makes a much tighter fit, with higher pressure between the teeth. This normally tight fit of the hypoid type of gear automatically eliminates the necessity for striking a compromise in the adjustment of the gears, but the whole system breaks down without benefit of extreme pressure lubricant. It is highly important to avoid mixing these extreme pressure lubricants. When more lubricant is needed, drain off and refill with lubricant that is all of one brand.

Working out the scheme of the overhaul this way you eventually come to the engine. By following this course it is not likely that you will skip over the fact that the main trouble with the car has been wastage of power after it was generated. That may save a lot of time and expense in needless carving into the engine. However, experience shows that there are few cases where prolonged wastage of power along the drive line or elsewhere in the chassis is not accompanied by actual damage to the engine. In an effort to compensate for power losses the driver naturally calls on the engine for more work. This is like over-taxing the heart to climb a hill with a lame leg—a losing proposition.

Fortunately we have much ingenious testing equipment these days to eliminate the need for guessing as to what ails the engine. Such equipment looks complicated, but it is simple enough in the tests it makes and the conclusions it helps the service doctor reach. One of the first steps is to check compression, testing each cylinder separately and taking readings following a certain number of rotations of the engine. Any marked variation in the number of turns required to build up to the maximum compression is as important to the diagnosis as the compression figure itself. If one cylinder builds up compression quicker than the rest it is blessed with tighter valves or tighter rings, possibly both. Here is the way to decide the matter:

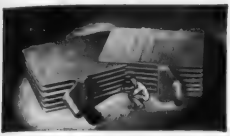
After reading all the cylinders go over the series again, squirting oil into each cylinder before reading its compression. The oil helps seal the rings so that there will be practically no leakage past the pistons. If compression remains low then the trouble is with the valves.

Moreover, a rise in compression, due to using the oil, indicates that the rings are not up to par. In either event, the cylinder head should come off without further delay. Without normal compression, or without even compression in all of the cylinders, a normal output of power cannot be expected.

The valve job should be considered as a complete reconditioning, not just grinding. Bent valve stems should be straightened. It is most important to have the valve heads true with their seats in the engine block. Any irregularity here will spoil the work. Where warpage of the block

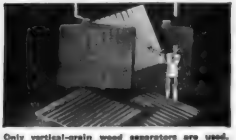
[*Continued on page 158*]

WHY FORD BATTERIES GIVE MORE POWER FOR MORE MILES

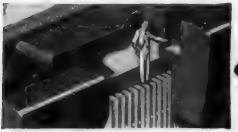


Large plate area provides a hotter spark and extra capacity for quick starting and the many electrical accessories of the modern car.

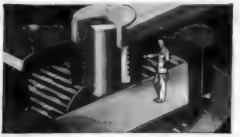
Oxides used meet Ford exacting specifications. Pieces are made of highest quality materials.



Only vertical-grain wood separators are used. They are uniformly porous. They provide low internal resistance and long life.



Cell covers rest on ledges providing additional support for inside elements from above.



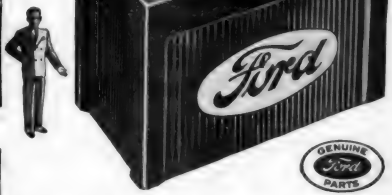
Posts are fused to lead inserts in cover to provide additional strength and prevent leakage of electrolyte.

• Look inside a Genuine Ford Battery and you'll find some of the reasons for its exceptional power and dependability. You'll find highest quality materials, large plate areas and vertical-grain wood separators. You'll find rugged construction for strength and durability. You'll find the results of expert workmanship — experience gained in building millions of Genuine Ford Batteries.

Other reasons are to be found in the testing laboratories at the Ford plant. There Ford Batteries undergo cold tests in refrigerators where zero temperatures are maintained. Normal and high rate discharge tests check them for stamina — long life. And tests where they are overcharged at a 15-ampere rate continuously, day and night for 30 days, prove their ability under severe conditions.

Quality materials, expert workmanship, rigid tests and careful inspections — for these reasons Genuine Ford Batteries give more power for more miles. For these reasons it will pay you to get a Genuine Ford Battery when your present battery needs replacing.

FORD MOTOR COMPANY
DEARBORN, MICHIGAN



A TYPE AND SIZE FOR EVERY JOB

TYPE 40—17 plates. Plate area 2859 sq. in. Capacity 100 amp.-hr. $8.90 and your old battery.

TYPE 40 D—15 plates. Plate area 2258 sq. in. Capacity 87 amp.-hr. $7.85 and your old battery.

TYPE B—15 plates. Plate area 2496 sq. in. Capacity 93 amp.-hr. $8.50 and your old battery.

TYPE A—13 plates. Plate area 2163 sq. in. Capacity 80 amp.-hr. $6.85 and your old battery.

(Prices subject to change without notice)

The Neglected Ground

[*Continued from page* 101]

such locations but it is difficult to get them. One is to hang a single-wire "counterpoise" more or less horizontally at some height within thirty feet of the antenna height, or even as high as the antenna. This is hard to do because of the supreme need of keeping it away from noisy buildings, and because landlords and ordinances combine against it. The far better method is to ground to the steel frame of the building if the building superintendent is able to suggest a practical point of access within twenty feet of the radio receiver. Though this is also a long path it is electrically very short because of the sheer massiveness of the steelwork.

For the single-house dweller this long-lead business simply means that a waterpipe or wire is equally dubious if it travels fifty or one hundred feet before going to ground, hence an outside driven ground may be better.

Any ground is dubious if it is being shared with the telephone company or the light company, who are the manufacturers of most of our radio noises. This is really a noise question, and can be taken up in another story, but it is another argument against waterpipes and anything connected to them—which almost always includes the heating system.

Any ground is dubious which does not go deep enough to reach permanent moisture. A rod driven five or ten feet into the cellar floor may be better than one alongside the house; a sure-fire receiving ground is a well or cistern without electrical circuits hitched to it. If dry earth cannot be avoided use a large area of metal such as four or six pipes driven a yard in hard earth or two wires thirty to one hundred feet long laid fanwise under the sod or in the cellar. The wires should be bare, and the joint should be above ground, which permits a single joint to combine both wires with the rubber-covered leadin wire. More wires in the earth-fan are sometimes useful if the space is small, as the idea is to bury sixty to two hundred feet of wire in some way without coiling or doubling. Sometimes a big loop around the yard is best for dodging trees and houses. The space close to the house is poorest because it is usually hard dry cellar-earth.

If the choice is between a fine ground at a distance and a dubious one nearby one must find the answer by trial, as the long wire may spoil the ground. Thus in one Connecticut location a well with a big sheet of copper roofing in it was only fair because too distant, while a driven ground directly outside the window was excellent as to both signal strength and noise though the neighborhood is such a rubble of boulders and gravel that pipes or rods refuse to go in more than three feet, which required the use of six short pipes in a row to secure good results.

Desert Travel Modern Style

[*Continued from page* 65]

Walls, doors, and partitions are faced with birch plywood. The ceiling is made of perforated aluminum which acts to deaden sound. All windows are of safety glass and are curtained with drapes. A silvery corrugated exterior, looking for all the world like something made from Mother's washboard, has some properties for deflecting sun rays, but any persistent outside heat or cold is stopped by insulation four inches thick in the roof and two inches thick in the sides.

Powered by a 150 h. p. Diesel motor, the tractor unit, sheathed in aluminum, furnishes a cab for the driver and his helper, air conditioning equipment, and space for baggage. At the rear of the tractor unit are hinged wings to enhance the streamlined effect.

Five 6.6 volt batteries connected in series and located in the tractor unit comprise the 32 volt lighting system for the bus. When the motor isn't running, interior lighting is used sparingly. Compression for the cooling system is obtained from a gasoline engine. Air intakes are in the roof and exhaust fans on each side push out the warm air. Filled to capacity with passengers, baggage, water, and two hundred gallons of fuel oil, the total weight goes over fifteen tons.

The one and only scheduled stop between points is Rutbah which is the nearest thing in real life to the movie conception of desert outposts. Grim walls, radio towers, and detachments of soldiers remind travelers of Beau Sabreur and the Foreign Legion. The hotel, a large restaurant, and an ice-making plant do a thriving business at this meeting point for air and motor travelers . Possessing the only wells which do not go dry during the hot spell, Rutbah attracts the Arabs who camp outside the fort with their camels and livestock.

During the rainy months of January and February, water collects in the hollows of the desert. Puddles and mud, hundreds of yards wide and several miles long, spot the trail. As there is no telling the extent of this area, it is impracticable to detour. Drivers with an acquired Oriental fatalism on coming to mud, warn passengers, then drive at full speed to slide across on the belly of the bus. As a concession to this practice, the new trailers (turtle-like) have completely enclosed bottoms. Sandstorms force a complete stop (seldom over an hour or so). The tight fitting doors and windows prevent discomfort.

To the astonished natives and wondering resident Europeans, the new busses are but the most recent surprise that Norman Nairn delights in springing upon the slow-moving East. He was the first to have a speed boat to skim the Mediterranean near Beirut; the first to own an airplane. Always wanting speed, Nairn now in his forties, has made a record of spectacular but profitable ventures.

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Reveals Mysteries Of Life

[*Continued from page 90*]

your microscope, held under the spring clips, and before attempting to study your captives, look to the proper adjustments of your instrument. There's the mirror: look through the tube regardless of focus or objects and manipulate the mirror fork with the thumb and forefinger of both hands, twisting and turning until the circle of light seen through the tube, hereafter referred to as the *field* of the microscpoe, is brightly and uniformly illuminated.

Daylight is best and hence it is well to have your laboratory table placed across a window. But you will need a 40 watt blue bulb for artificial light for night work and for dark days, so an electric outlet should be available.

Now cut down the light so that it is strong enough to see everything clearly, but not so bright as to produce glare or obscure finer details. This is done on some microscopes with a condenser, on others with an iris diaphram, both located beneath the stage, while if neither is present, sit back farther from the window, push the lamp away to a greater distance, or use a filter. This may be a flat-sided bottle filled with water, which diffuses light and absorbs heat when interposed between lamp and mirror; or it may take the form of a small screen of blue glass or variously colored cellophane.

The focus comes next. Have the low power objective in place and rack it down with the coarse adjustment, while looking from the side and not down the tube, until it is within one-quarter inch of the cover glass; then look through the tube and raise it slowly until the object comes into view. This is termed *focusing up* and will never result in broken slides, smashed preparations or cracked lenses as focusing down may do. It is the only correct way to secure a focus. If your microscope is equipped with a nose-piece, the high power objective may be swung into line at any time; otherwise, a focus with high power is secured in the same manner as with low.

One of the accompanying illustrations shows the parts and construction of a modern compound microscope and the path of light rays through the various lenses. Study this picture in order to learn the names of parts and to gain an idea of how magnification is produced. The combination of lenses in the objective provides an enlarged image which the eyepiece again magnifies. Combinations are necessary in order to give a sharp and clear picture, without either spherical or color distortion, one lens correcting the defects of another.

What will one see when he thus invades the privacy of the microcosm with a magnified prying eye? There are so many possibilities varying with different sources of cultures that several large volumes would be necessary to describe all of the inhabitants of this land of Lilliput.

Among Green Algae, which are simple plants consisting of a single cell or else aggregations of cells to form a colony, ***Euglena*** is an abundant spindle-shaped organism, bright green in color and bearing a long but extremely fine whiplash,—the *flagellum*,—at the anterior end, by means of which it is propelled through the water by the same principle as a propellor on the front of an airplane sucks the machine forward. ***Euglena*** is an independent single cell; ***Volvox*** is a spherical colony, like hundreds of *Euglenas* bound together. Huge for a denizen of the Microcosm, *Volvox* rolls along like a green bowling ball, hundreds of flagella lashing in unison; a pretty sight indeed.

Spirogyra is a colony of green cells placed end-to-end, forming a very thin filament; Pond Scum is a common name for this plant, which occurs as a coating on submerged rocks and logs in swift water as well as quiet spots. Desmids are curiously symmetrical, one-celled algae, of many a devious pattern, rivaled only by the great group of Diatoms, which we shall consider later in a separate article.

One-celled animals are comprised within the vast assemblage of Protozoa—the most primitive forms of animal life. There are the rhizopods or rootfoot protozoans, as ***Amœba***, which progress by sending out blunt protrusions of their cell substance, termed *pseudopodia;* ever forming and disappearing, ever changing. There are flagellates here as well as among plants, ***Astasia*** and ***Peranema*** being fairly common examples. Lastly, the ciliates are the largest, most numerous and varied, and by far the most interesting and active of the protozoa. These are clothed with a great many fine, short hairs, the *cilia*, with which they lash their way through the water with amazing speed and agility; twisting, turning, stopping almost instantaneously, even reversing.

There are small forms of sponges and the freshwater polyp, ***Hydra;*** minute worms of several different groups; Rotifers, distinguished at once by two circular crowns of cilia at the head end, beating either for locomotion or to drive food into the insatiable maw; and finally the microcrustacea—those elfin relatives of the crab and lobster that are so intriguing to watch under the lens. ***Daphnia***, ***Cyclops*** and ***Branchipus***, known as Water Fleas and Fairy Shrimps are so transparent that one can observe the heart beat, all stages of digestion, and the entire cycle of development of the eggs—truly an animal that lives in a glass house.

Movement is perhaps the most striking feature of the Microcosm—incessant, bewildering, blundering movement, without benefit of reason or, in most cases, of vision. One wonders where they are going and why, and what makes them do it. Plants must seek the sunlight in order to manufacture their food, and animals must seek each other, picking on the smaller, the slower, the more defenseless. For it's dog eat dog in the Microcosm, and you will not have to watch long

[*Continued on page 137*]

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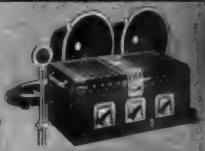

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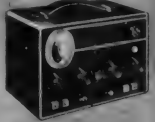

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Dryers Speed Photo Finishing

[*Continued from page 110*]

One warning is necessary. *Do not connect the two heating elements in parallel across the house current supply.* They will get too hot for the film to stand without damage, despite the formalin bath. Follow the wiring diagram and there should be no trouble.

Now to make the ferrotyper. In use the operator places a ferrotype plate on the curved sheet iron top of the machine with the squeegeed print uppermost. Placed thereon is a thick padding made of a number of folded paper towels stretching over the padding with a thick piece of cloth and fastened to a stick so that it can be hooked over the nails projecting at the front of the dryer. Under this pressure the steam generated by the dryer is quickly absorbed and dissipated by the paper padding, resulting in crackless prints of fine quality.

Under the dryer is placed a sheet of asbestos to protect the workbench. This is necessary because the bottom of the machine is open. A switch on the left side of the cabinet controls the four heating units of the ferrotyper.

The construction of the ferrotyper is extremely simple. The cabinet is of plywood construction with a sheet of asbestos tacked all around the inside to protect it from the heat. The bottom is left open for adequate ventilation and for better distribution of the heat over the whole surface of the sheet iron cover.

The ferrotyper frame measures 11 inches in width and 16 inches in length. The side pieces have a slight convex curve at the top, being segments of a circle of about 4 feet in radius. The end pieces are rectangular, as are the inner pieces which separate the porcelain sockets. The cross pieces should be placed so that with the size of the materials used they approximate the arrangement shown in the frame construction diagram.

After the frame has been constructed, line it with asbestos, then locate the sockets so that the heating elements are about ½-inch below the line of the sheet iron which will cover the frame; then wire the sockets and switch a series connection for each two units, similar to that used in the film dryer. Here, again, do not hook them individually across the line or the excessive heat will result in scorched prints.

Now screw four legs to the ferrotyper so that it is about 8 inches from the workbench. The top comes next and is unusual inasmuch as it is not actually fastened to the ferrotyper with screws or nails but is free to slip under four brass clips as it expands with the heat. If it were anchored firmly in place it would buckle with this expansion. The clips at each corner allow the sheet iron to expand in all directions without strain, and contract again when cool. After the wiring is finished complete the top by placing the sheet iron on the frame, springing it down at each end and clipping it under the corner straps.

The piece of heavy cloth is now fastened under a batten at the back end of the ferrotyper. The other end of the cloth is fastened to a stick, 13 inches long, through which two small holes have been drilled to correspond to the two nails which are driven into the front of the machine. To get tension, this cloth roll stick, thus shortening the length of cloth until it can just be caught on the nails with the ferrotype tin and paper towel pad in place. The slight curve of the top causes the ends of the ferrotype plates to spring, so as to keep the pressure adequate and constant. If some pressure is not exerted the prints will not ferrotype evenly.

The ferrotyper requires about five minutes to get warm sufficiently so as to do good work, and operates at its best after one or two prints have been finished. Using two 10x12 ferrotype plates, and processing a print on one while the other is being baked, the machine will deliver a print about every four minutes or less, which is just right to give a print a final rinse and squeegee it carefully to the plate.

Using the same construction idea, ferrotypers of larger sizes can be constructed to accommodate larger plates and thus handle more prints at one operation. For the average amateur, however, the ferrotyper described will be adequate.

U. S. Wages War On Insects

The island of Guam is to be the first line of defense in the fight to prevent the invasion of America by insect and plant pests from the South Seas and the Orient. R. G. Oakley of the U. S. Bureau of Plant Quarantine will supervise the inspection of plants carried either by vessels or airplanes.

Wild Birds For Household Pets

[*Continued from page 59*]

peck, then run after it and peck it again. So I suspended the ball from a board like a punching bag, and now the mocking bird literally "punches the ball" like a veteran prize-fighter. Don't try to force a bird to do tricks; but convert the bird's natural inclination into doing tricks.

Birds seem to be the natural prey of cats, but a well-fed house cat can quickly be taught to leave birds alone. Place the bird-cage on the floor and let the cat prowl around it. The cat is prompted more by curiosity than by the desire for something to eat. Stand by with a husky switch. If the cat makes an overt act toward the bird, give him a stinging cut with the switch. He may need the switch a second time, but I never saw the cat that came back the third time. Thereafter birds are off the cat's calling list.

Sometimes friendship develops between a cat and a bird. My cat and mocking bird play together by the hour. The bird even pulls the cat's whiskers. It is truly funny to see the cat spar with his paws to defend his whiskers.

The smartest bird I ever raised is a female English sparrow. This bird will carry a note to any member of the family she is told to *and to no one else*. If she can't find that party, she "returns to sender." She just picked up this trick herself and I am at a loss to understand it. Ordinarily she is a very affectionate little bird, but the affection turns to terrible rage when I tell her "you're only a piece of cat-meat!" Then she sets up a wild chattering and flies right at me, and it takes me half an hour to soothe her.

A photograph with this article shows something very unusual—a pet owl. Ordinarily owls are very man-shy and untameable. I rescued this little screech owl as a little lump of fuzzy feathers. I raised him on the egg-yolk and raw meat diet, and built him a nice dark cote up under the roof of the garage. Finally when he was strong enough to fend for himself, I opened a little outer door of the cote so he could fly out into the night. He did, and I said a rather sorrowful "good-bye" to "Hooter," as I called him. But in the morning he was back in his cote again. Now he flies about every night, and frequently comes into the house looking for a piece of raw meat that I always have waiting for him. To see him tear a piece of meat with his talons makes me glad that "Hooter" and I are on a friendly basis. The cat got too curious one night and learned the feel of those needle-like talons, and henceforth has a wholesome respect for Mr. Owl.

Gaining the confidence of wild birds is very interesting—and puzzling, too. Birds have a higher degree of intelligence than most people think. And they possess some sixth sense—something you can't grasp or quite understand. How does a homing pigeon find its way to its own loft? No one knows. If you get intimately acquainted with even a common sparrow other unanswerable questions will crop up, too.

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Swamp Lands Bring Fortune

[*Continued from page 69*]

men, dust clouds of armies, clash of arms and roars of triumph. Salt deposits of early times were the scenes of bloody battles between nations, for their possession. Even the word "salary," in common use today, is derived from the Latin "salarium," meaning the stipend paid to Roman soldiers in bags of salt.

Having a strange and romantic history, the Alvarado Salt Farms were first established by the Spanish padres who explored and Christianized California. Owing to the difficulty of transporting salt from Spain and Mexico, they conceived the idea of constructing a crude refining plant on the shore of San Francisco Bay. Needing but a small acreage in comparison to that used today, they built dikes, allowed the sea water to flow in through a narrow opening, then dammed the entryway. When the water evaporated after several months, the padres and their Indian converts had salt enough for their needs.

With the waning of the mission power in California, this first salt farm was abandoned. By a singular coincidence, when American and European pioneers came into the Pacific Coast states the same land was sold—sight unseen—as *farming land* to a number of Danish settlers. When the would-be farmers took possession they knew they had been victimized; they were without redress, owing to the chaotic condition of courts and law enforcement agencies of those days.

Instead of tamely pocketing their loss and abandoning the land, the Danes decided to raise salt! A settler named Peter Christiansen is credited with being the originator of the idea, and it has proved highly successful.

Through the years the salt farm acreage was steadily increased, the crude methods of the padres were improved upon, and the many small producing units gradually merged under the name of the Leslie-California Salt Company.

As carried on now, salt farming comprises the complete cycle of an odd and little known industry. The salt is "planted" by pumping sea water into ponds varying in size from 200 to 400 acres. Allowed to rest over a twelve-month period, the action of sun and wind concentrates the water is to density of twenty-five per cent salt, at which point the water has reached a state of saturation.

The crop is then "cultivated" by transferring the brine, as it has now become, into smaller crystallization ponds from four to twenty acres each in size. Here the salt crystallizes on the flat bottom, leaving impurities such as magnesium chloride, bromine and potassium salts, in the brine. Having a higher degree of solubility than salt, this foreign matter remains in the solution. There is absolutely no waste to salt farming, the by-products being salvaged by again pumping the brine into special ponds. It is then

[*Continued on page 141*]

Where Playing With Fire Pays

[*Continued from page 37*]

endure the savage, searing assaults of the powerful, snapping, crackling current, the test can be rated a success.

But not all the work done is spectacular. Much of it entails the slow, tedious, plodding search for facts that marks the progress of science everywhere. It's a monotonous job to determine how many times a push button in an electric wall switch can be snapped on or off before it breaks down. This investigation is turned over to a mechanical robot, capable of reproducing six different motions of the human hand required to operate the most common types of switches. There's no fun in a test of an electric sign-flasher, to determine if the spacing between the current-carrying and the non-current-carrying parts is sufficient to permit proper functioning without "freezing." Even less entertaining, perhaps, is the "once-over," many times repeated on a radio, to learn if excessive temperatures are generated in the set or cabinet, or if high-potential parts are accessible to contact.

Obviously, though, the results of these and multitudes of other tests have far-reaching importance. Medical authorities have determined that a very small current, expressed in the thousandth part of an empere, is sufficient to cause death, especially to persons with weak hearts. The investigations give assurance to the beauty parlor operator that her permanent wave apparatus will not overheat and start a fire in a patron's hair or give a shock that might prove fatal. They make it certain that when mother stands bent over her electric washing machine, her hands in the water and her feet in a pool on the floor, there will be no current-leakage, through improper material or construction, to kill her.

Through this work, sister is made confident that if she forgets to turn off the "juice" on the waffle iron, the house will not be set on fire because the heat baffles were not properly placed. And they remove the fear that the electric refrigerator in the kitchen might let out clouds of deadly gas in your home while you sleep. It is with such problems as these, intimately touching the lives of multitudes of persons, that the experts here wrestle daily.

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[*Continued on page 142*]

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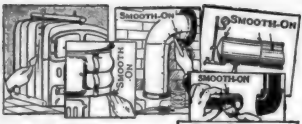

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Early American Arm Chair

[*Continued from page 96*]

lower chair assembly and draw all joints tight.

When set, trim leg ends so that the chair rests firmly on four feet, seat height shown in Figs. 2 and 3. Then place the back spindles and upright side rails. Here, as with the legs, check the slant carefully before boring holes. Next, place arms in position, and determine required slant to splats and arm supports. The arms are held to back rails with hidden flat head screws, as shown in Fig. 14. Make a temporary setup of upper chair and check all joints. Then glue, and clamp into position. Drive glued wedges in kerfs of splats and arm supports, Fig. 13. Wipe off all excess glue with a damp cloth. When thoroughly set, dress down splat ends flush with arm surface, and sand over all with number 00 sandpaper.

To obtain a golden mellow tone, apply light oak stain and rub off quickly with a dry cloth. Follow this with a coat of white shellac, which is rubbed with fine steel wool when dry. Next apply a coat of good furniture varnish, which should also be rubbed with steel wool when dry. After each rubbing be sure to clean the surface with a cloth before applying the next coat. Apply the second and final coat of varnish and let stand until thoroughly dry. Then rub to a satiny finish with pumice stone and oil, using a soft felt pad for this purpose.

As a suggestion, attractive tie-on cover pads can be made of home spun material, which can be purchased in a variety of harmonizing shades.

Plates Made With Stencils

[*Continued from page 91*]

hard rubber tray containing a small quantity of nitric acid diluted with forty times the amount of water.

Rock the tray continually until it has etched sufficiently for a second powdering. After drying it, hold the plate in an almost vertical position and dust more of the resin over it from top to bottom, then heat it again so that the resin will adhere. This will protect one of the four sides of the etching, but it will be necessary to protect the remaining three sides in the same way, giving the plate a quarter-turn each time.

Replace the plate in the solution after adding more acid, allowing it to etch until there is sufficient relief for printing. Clean the plate with benzine and mount it on a block to make it type-high, after which it is ready for the printing press.

When using the plates to imitate typewritten letters on the printing press, an almost perfect result can be had by interposing a sheet of thin China silk between the gripper bars so that it comes between the plate and the paper at each impression.

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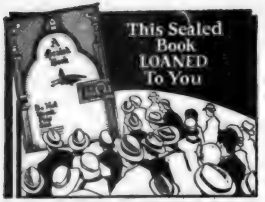

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Woodcraft Kitchen Creations

[*Continued from page* 73]

piece is cut from stock 15 inches long, 1¼ inches thick and 1¾ inches wide. The slots are also made with the dado cutter. A neat project requires smooth, graceful lines and these will depend upon your skill at the drum sander. Paraffin or beeswax is used for the finish. If two inches of waste are left at the end of the handle, you can jig or band saw the rough outlines readily. The waste holds all pieces together until the curved sawing is finished. After which it is sawed off.

Of unusual design and chic appearance is the *cake "trowel"* or spatula about to be described. It is cut from a single piece of attractively grained wood.

Start with a block of wood 2½ inches wide, 14½ inches thick and 8 inches long, with the length and width increased if desired. The first cut is made with the bench saw—a segment ripped from each upper edge leaving the full width at the bottom with the thickness a little more than ⅞ inch. Clamp this remaining piece in the vise and cut out the next, either with a keyhole saw or a hack saw. Note that the cut curves to meet the top surface of the trowel proper. The final saw cut is made with the same saw and also curves outward at the bottom. Enough wood, though, must remain in what will later be the portion between blade and handle so as to give sufficient strength.

From here on, the finishing is done with the drum and disc sander. Much will depend upon your seeing that one curve blends into another to form a harmonious whole. The edges of the blade are sanded off rather sharply to make a dull knife edge so that the blade will slip easily under the cake. The handle can be made with octagonal sides, or rounded completely as was done on the original spatula. A hot beeswax finish should be applied liberally and the surplus rubbed off with a cloth. Utensils such as these will retain a nice finish with an occasional rubbing, almost indefinitely, if not subjected to hot water. They can, though, be rinsed in cold water without any damage whatsoever.

Fish Yield "Liquid Gold"

[*Continued from page* 53]

of the commercial fishermen. In spite of the removal of such a large number, the supply will always be sufficient for the needs of mankind, because the Lake of the Woods is one of the largest inland lakes on the North American continent; besides, these fish live in plentiful number in other lakes in Northern Minnesota.

The livers are large, and represent approximately ten per cent of the total weight of the fish. They must pass rigid tests for freshness and possible defects. The oil is then extracted and put up in package form for the market.

[*Continued on page* 136]

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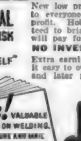

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Carving Miniature Poles

[*Continued from page 79*]

Keep in mind the fact that the more grotesque these creatures are the more authentic will they appear when completed; do not attempt to achieve correct anatomical proportions, and your workmanship need not be superfine. Make the job look as though it had been created by a primitive mind, executed with crude tools.

A more elaborate miniature totem, an adaptation of a famous original erected in Pioneer Square, Seattle, can be carved after completing the simpler version. The miniature should be about 14 inches high, and mounted upon a substantial section of a pine or spruce branch.

Paint the totems in bright colors, red yellow, blue, green and black, using oil paints. Use white for eyes and teeth. Make no attempt to paint the figures in their natural colors.

The carved figures on the Seattle totem have no religious significance, being rather a family history. On the top there is a carved raven representing one of the two head clans of the Thlinket tribe. Below the raven is a medicine man holding a frog by the hind legs, head down, probably to spill the evil spirit which this creature is supposed to possess.

Next is Annihoots, the Brown Bear, representing a sub-clan of the Wolf clan; below him an eagle, sitting on the curled-over tail of the finback whale, which has a seal in its jaws, and the bottom figure is an eagle rampant, indicated by its fierce expression and claws in fighting position. The accompanying drawing is not as complete as the original Tongas totem, having been modified so as to make it easier to duplicate.

The craftsman need not limit his activities to the carving of primitive totems; modern totem poles depicting the favorite sports or hobbies of its designer are equally interesting and no more difficult to make than the ancient Indian varities.

An excellent example of a modern totem pole is shown in the illustrations on page 79. Boating, motoring, swimming, riding, football and hunting are all uniquely depicted in the various carvings on the pole. In designing a modern totem the subjects can be left entirely to the discretion of the craftsman.

Museum Gets Indian Graves

Under wings of a museum to be built 16 miles from Tuscaloosa will be exhibited 63 burials of Alabama's prehistoric mound building Indians. The Indian graves will be shown just as archaeologists unearthed them during the past year. The museum is to be called the Mound Park Museum, and is planned by the Alabama Natural History Museum with cooperation of the National Park Service and the CCC. The central part will house relics of the mound builders found at the site in the past ten years.

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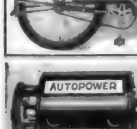

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Scan The Sky With Telescope

[*Continued from page 77*]

the reflection of the mirror is seen in the center of the prism.

This mounting is so designed that the eyepiece, when observing stars near the zenith, will be at the right height for a standing observer. For stars lower in the heavens, the observer should be seated.

The wooden parts of the mounting should be kept well painted and the polar axis lubricated with hard grease.

To aid in finding stars, a small screw eye should be placed at the lower end of the mounting and a small nail with a head driven into the mounting at the upper end. These act in the same way as the sights of a rifle. To adjust them, line the telescope up with some close object, such as a building, and bend the nail until the sights are correct.

For locating interesting celestial objects during the seasons of the year, the worker should purchase a simple text on astronomy having seasonal maps of the constellations and planets. There are many non-technical books which your local book seller will be glad to show you. There are also several monthly periodicals giving this data.

Newspaper reports of comets and other interesting celestial phenomena generally give the constellation in which the object is located.

Your telescope should be placed where it is shielded from excessive wind and incidental light arising from city street lights, electric signs, or other similar sources. If you have difficulty eliminating such incidental light, take two one-foot sections of stove pipe and fix them around the mirror and prism as indicated by the dotted lines in the diagram. They will act as excellent light shields.

A small portable house or shed will be found extremely useful to shield the observer in bad weather. This will greatly increase the usefulness of your telescope, as clear, cold nights are often best for observing.

There is a large number of local telescope and astronomical clubs throughout the United States. The worker will find that affiliation with one of these organizations will greatly aid him in solving the problems which arise in the process of telescope construction and use.

This series of articles does not pretend to tell the worker how to construct a machine-made and ultra precise telescope. Study of the many books on the subject, much practice and a well-fitted workshop, are necessary to construct such an instrument. However, if the worker carefully follows the directions given in these articles, he will be able to construct a telescope which will forever make the night sky a more interesting and lovely sight.

Taking Indoor Portraits

[*Continued from page 113*]

"dramatic" and other types of "special" lightings, your procedure will be to emphasize the stronger or the weaker light, depending on the result you are trying for.

All you need in the way of lighting equipment is two or three reflectors, a supply of photoflood bulbs, a tripod and a patient subject.

Reflectors may be used in three ways. You may buy collapsible cardboard reflectors which may be fitted into the home floor lamps or table lamps. You may purchase metal clamp-on reflectors which are clamped to the back of a chair or other piece of furniture or even on the tripod itself, or "go the whole hog" and get a pair of stands with reflectors attached. The latter is by far the best bet since the stands are adjustable to various heights and afford greater convenience in arranging lightings. A lighting outfit of this type is surprisingly inexpensive and may be had for as little as $5. Or you may purchase one stand with double reflectors and use a clamp-on reflector as an auxiliary light.

Your tripod, if you haven't one already, should be the best you can afford, since an unsteady tripod can upset the whole applecart of careful lighting and careful posing and focusing by a slight shake during the period of exposure. Unless you are taking a snapshot from the hand, which is really not advisable in the kind of portrait photography here discussed, you should use a cable release in making exposures.

Any miniature camera may be used in making portraits by artificial light. Do not feel discouraged if your outfit is not one of the very expensive types. Some very rank pictures have been made with cameras costing several hundred dollars; likewise, some of the finest portraits ever seen have been made with cameras in the lower brackets.

A word about the background. If you were photographing a child and sat him or her down in a large arm chair and included in your picture just the child and the chair, the back of the latter would serve as your background and be excellently suited to the purpose. Likewise, when making a photograph, whether of child or adult, an appropriate background is as a general rule a fireplace, as it is very effective. In the main, however, it is generally advisable to maneuver things so that your subject is moved away from all background distractions and provided with a background of blank space, in short, a plain wall. You may have to do a little temporary furniture moving in order to provide the plain wall background, but where the placing of your lighting units already will somewhat disturb the peace of the house, no serious objection can me made to this furniture moving.

The subject should be placed about two feet away from the background and then the camera set up. The camera set up about six feet from the subject, this will throw the background somewhat out of focus, which is just what you want, since you want the attention on the subject alone.

The posing of the subject depends on the characteristics of the person being photographed. There are three conventional ways of posing the head: facing the camera head-on; the three-quarter view, in which the subject faces in a diagonal direction; and the profile. A child will "take" well head-on, as is most always the case. The three-quarter view is in many respects a more pleasing adult pose, while the profile is very suitable for persons with attractive profile contour. It will not do for everybody, however. In general, in the case of either the three-quarter or the profile pose, be careful to have the "best side" facing the camera, since in many instances one side of a person's face is more attractive or more characteristic than the other. It is a known fact that the two sides of a person's face are not identical in appearance, but the difference is more marked in some instances than in others. In fact, the difference is not sufficiently apparent to worry about.

We spoke of lighting equipment at the start of this article. We must add that in addition to the reflector back of a bulb, which is used to throw the light forward, there is another type of "reflector," which is termed a reflecting screen to distinguish it from the other. This is any light surface, such as a newspaper, a bedsheet, a light-toned cardboard, or what have you, which is so held or placed in relation to the subject that light cast upon the screen is reflected in a desired direction. The screen is generally used to lighten the shadows in cases where the use of other light would not be advantageous. In making the illustrations which accompany this article, the white enamel side wall as a reflecting screen and found it admirably suited his needs.

The impromptu "studio" set up for taking these illustrations was a corner of a room in which a bed ordinarily stands. The bed was moved out of the way. A dressing table bench was placed two feet away from the background and two feet from the side wall. On this bench the several "models" successively took their places. The lighting equipment consisted of a double reflector on a stand and a clamp-on reflector. The latter was attached to the back of a chair and the chair moved at various distances from the subject

[*Continued on page 138*]

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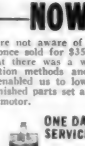

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"Daylight" Tanks from Bottles

[*Continued from page 106*]

For the cover, cut a piece of plywood the same size as the paper collar, fasten a part of a large spool to one side of it and drill holes in opposite corners to take pieces of rubber syringe tubing. Cement two layers of innertube patching rubber to the bottom of the cover; cut holes in the corners over the holes in the plywood and cement the rubber tubes in place. Let one of the tubes project about ½-inch and double it back so it will hold a piece of glass drinking tube, then cut the other tube off flush with the rubber sheet.

All that is necessary now is to slip coil springs over the rubber tubes to keep them from collapsing, and wind them around the spool. Wrap a second layer of paper around the bottle, letting it project one-quarter inch above the first layer, and dip it in wax. Give the outside of the bottle several coats of black paint to exclude all light and secure the cover to the tank with a stout rubber band.

To load the tank, place two films face to face and slip them into the tank. They should spring away from each other at least a quarter inch in the center. If the bottle is a little too large, or you wish to develop four films at a time, fold a piece of celluloid to from a series of channels for holding the film. In loading the tank, slide two films partly into the tank and place the celluloid strips over the edges of the films, then slide the whole into the tank. The other films can be placed in afterwards.

To bend the celluloid film holder, place it in hot water for a minute and bend it while it is still warm. Set the creases with a warm, but not hot flatiron. If the iron sizzles, it is too hot.

The tank should be filled through the hose in which the glass tube is inserted. This should reach almost to the bottom of the tank to keep the solutions from spattering on the films.

Fish Yield "Liquid Gold"

[*Continued from page 130*]

Baudette is reaping a harvest from this new industry. It looks like a gold rush town, with people talking excitedly about the new liquid gold, the term by which the oil has come to be known, that is pouring money into the pockets of the fishermen.

The discovery of this new oil has proved beneficial in several outstanding ways. It has established a business for T. H. Rowell and his father that is growing by leaps and bounds. The modern plant on the shores of the Lake of the Woods employs a large number of people and is taxed to capacity.

Air pressure on the body of an average sized person amounts to about 14 tons.

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Reveals Mysteries Of Life

[*Continued from page 122*]

before seeing numerous evidences of this omnipresent tragedy of life.

As you will soon discover, slides made from cultures as directed thus far will dry out rather rapidly, and it becomes necessary to add a drop of water at frequent intervals to prevent such a catastrophe. Take a drop from the same culture as the one under inspection and place it just at the edge of the cover glass. If properly done, it will run under the cover by capillary attraction and will not wet the top of the cover. One method of prolonging the study period is to coat the edge of the cover all around with a thin ridge of vaseline, placing this side down in making the slide and thereby sealing in the fluid and preventing evaporation.

The depression slide forms a veritable microcosmic aquarium. This item has a spherical concavity ground into the center of one surface, and will hold several drops, which may be covered and sealed with vaseline and thus provide more material than a plain slide can do. Or you may try a hanging drop suspension; place one very small drop in the center of a cover glass, invert this over the empty depression, breathe into the cavity to moisten its content of air, then settle the cover glass in place. The organisms contained in the drop have a great degree of freedom by this method.

Dilute a few drops of tincture of iodine with approximately 100 volumes of water and use this dilute solution as a stain, adding one small drop to a slide rich in protozoa by allowing the iodine to run in under the cover. This chemical will kill and stain all the forms of life present, bringing out the nuclei of cells; those small, central, governing bodies which are often invisible in life. Diluted mercurochrome may also be similarly employed. Neutral red is an example of a dye known as an *intra vitam* stain, since it will color without harming or killing.

Start rearing some microcosms of your own by placing tap water in a battery jar or fruit jar and allowing to stand for two days to exhaust the excess dissolved oxygen. Then push in and submerge a handful of dry hay in one jar, some lettuce leaves in a second, and any other plant material you may wish to try in a third. Allow to stand uncovered for a few days, then place a glass plate across the top of the jar to keep down evaporation.

The cycles of life that develop in such situations are truly amazing. Bacteria appear and feed on the hay. Then come small protozoa and then larger ones; finally worms and rotifers;—each cycle feeding on the preceding one until at last all the energy is exhausted and the life dies out.

One gadget you can make for yourself if you like mechanical operations is a device to compress the material between slide and cover glass by

[*Continued on page 139*]

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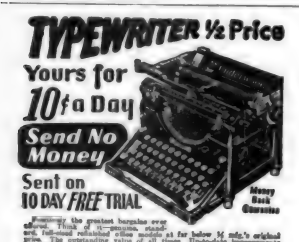

Animated Jumping Horse

[*Continued from page 98*]

front wheels are merely drilled at the center for the axle of No. 10 wire, but the rear wheels are drilled at the center and again at a point ¼-inch off center this is for the crank effect of the rear axle.

Nail the hurdle to the top of the base and nail and glue the front and back pieces to this top. Carefully measure the width of the base and assemble the side pieces, washers, wheels and another washer in that order. Form a loop in the ends of the front axle to retain the wheels. With the rear axle, bend the crank first, then assemble as with the front assembly. Bend the ends as shown in Figure One to fit into the rear wheels, then nail and glue the assembled sides to the top of the base.

Using a flat head wood screw fasten the jockey to the inside of one of the body pieces, but do not tighten, as the jockey must move. Now tie two short rubber bands to connect the screw-eye in the jockey to the eye in the *head* and *tail* piece. These should tend to pull the legs DOWN and cause the jockey to follow the movement of the head piece as the screw-eye slides on the horse's neck. Tie the ends of a cord to the eyes in the head and tail pieces. Drill the top piece of the hurdle through the center with a ⅛-inch drill, and likewise through the base at the center. Pass the cord through the hole in the top of the hurdle and assemble the other half of the body as shown in the details. Nail and glue the top of the hurdle to the halves of the body and attach hurdles to uprights. Pass the cord, through the hole in the base, to the crank by means of a small wire ring which prevents the cord from winding. Some adjustment may be required but this is simple as the rubber band assists gravity in forcing the legs down while the crank pulls them up.

Enamel the finished toy in gay colors and insert a screw-eye in the front for the pull string.

Taking Indoor Portraits

[*Continued from page 135*]

as desired. The regular 25c photoflood bulbs were used. The exposures varied from 1/5th to 1/10th second on Panatomic film at the full opening of the F 3.5 lens and the camera was six feet from the subject.

This equipment and the facilities mentioned are certainly within the reach of every amateur, yet it will be apparent from the diagrams describing the set-up for each picture reproduced here that quite a number of different effects may be obtained merely by shifting the various units about. A strong light from the side was obtained by having the light about three feet from the side of the subject, while the relatively weak general light was obtained by moving the chair bearing the clamp-on reflector some distance away. A spotlight effect without a spotlight was achieved by placing a light back of and above the subject so that the light beams came down at an angle. Ordinarily lighting with reflection from the side wall "screen" to light the shadow side of the face was the result of placing the double reflector at a 45° angle in relation to the subject and lighting the "screen" by directing the light from the clamp-on reflector in such a way that it hit the reflecting wall at the correct angle.

The diagrams tell the story of what was done about the lighting in each case. You may try these arrangements, if you like, but they are not the last word. They are merely suggestions.

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Reveals Mysteries Of Life

[*Continued from page 137*]

means of a fine screw which is capable of slow and exact adjustment. We have mentioned that movement is an attractive feature of the microcosm; but when you wish to study details under high power or to take a photograph—then all this rapid movement becomes a handicap. The larger forms may be compressed to the point where they cannot move, yet without enough pressure to cause them to burst. The accompanying photomicrograph of *Daphnia* was obtained by this means.

Use aluminum or brass for the plates and brass rod for the pins and posts. The bottom plate is drilled about 1/32-inch smaller than the circular piece of glass to be used, the latter cut from a thin slide or utilizing a heavy circular cover glass. Rout the hole to the exact size of this glass and just deeply enough so that the glass is slightly above the surface of the metal bottom plate. A deeper trough is cut outside of this to catch any overflow of liquid. To one side are drilled two small holes into which are force-fitted the post and guide pin.

A hole of the same size as the one in the bottom plate is next drilled in the compression plate, but the sides are tapered outward. Then cut the piece of metal to shape and size. Solder on a short piece of rod and drill rod and plate to make a sliding fit over the post of the base plate. Mark up the top of the guide pin with a soft pencil, then slide the compression plate assembly down the post so as to mark the point where plate and rod should be drilled to receive the guide pin.

Tap the hole in the brass rod for a short distance at its upper end. A short piece of larger rod is then turned and threaded to fit this, knurled 5/16-inch from the threading, drilled and tapped for the fine thread of the adjustment screw, and then cut off. The screw is turned from a piece of brass rod also, but if you lack facilities for this sort of work, purchase a nut and bolt with the finest available thread. Solder the bolt to the top of the sliding rod and build up around the top of the bolt with solder which is later filed to a neat, rounded end. Plastic wood can be moulded onto the top of the bolt to form a knob of convenient size.

By means of liquid solder, a tension spring is next fastened to the top of the post. The compression plate and drilled rod assembly is slipped over spring and post so that the spring can be snipped off even with the top of the drilled rod. Thus the spring will act as long as the compression plate is not touching the bottom plate, and no unnecessary pressure will be accidentally applied to the two glass parts. The spring is now attached with liquid solder to the brass turning which fits the top of the drilled rod, then smeared with the liquid solder. Slide the compression

[*Continued on page 141*]

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Build "Hollywood" Floodlight

[*Continued from page 105*]

they will last even longer than ordinary light bulbs. No dangerous knife switches or costly special switches are needed; the two switches used cost but fifteen cents each at any hardware or ten-cent store.

The total cost of this Hollywood-power floodlight is surprisingly low, as you can see by looking over the layout of parts in Fig. 1. Screw-ring porcelain sockets solve the socket-mounting problem and at the same time give extra room for the large bulbs.

The positions of the socket holes will depend upon the size of dishpan and the type of sockets used. With a 15-inch diameter pan and No. 2 bulbs, the centers of the socket holes cannot be more than 2 inches below the rim of the pan. Space the sockets equidistant, punch the centers with an awl, and lay out 1½-inch diameter holes with a compass or dividers. You can cut these holes out of the thin aluminum most easily with a sharp pen-knife, using a half-round or round file to smooth rough edges. Incidentally, if you plan to use only the smaller No. 1 photoflood bulbs, these holes may be considerably deeper in the pan.

Now cut two 5-inch diameter discs from quarter-inch plywood, and cut a 4-inch diameter hole out of one of the discs. Cut out ¼-inch wide pieces radially out of the resulting ring at equal distances and nail the three segments to the other disc. This provides slots for the socket wires and plenty of room under the socket-mounting disc for making connections. Mount the sockets in position with wood screws after drilling the four holes for the wires. You can follow either the pictorial wiring diagram or the schematic circuit diagram when wiring up the sockets, switches and the connection cord. Solder each connection, then cover with rubber and friction tape. After testing your wiring, mount the switch unit on the back of the reflector with wood screws, and assemble the sockets in their holes.

The strap hinge needs some alteration before it is ready for use. Saw off one head of the hinge pin, force out the pin with a blunt punch, and make a 1½ or 2-inch saw cut down the center of the "Y"-shaped half of the hinge so it can be squeezed together more easily. Now, when the ⅞"x3" carriage bolt is used as a hinge pin, the hinge can be locked in any position simply by tightening the wing nut. If there is too much play in the hinge, to permit this, or the hinge binds in certain positions, file the bearing surfaces down enough so you can insert a thin washer to take up all play. Fasten the hinge to the inside of the reflector with two flat-head stove bolts, using large washers under the nuts on the outside of the pan. Cover the outer half of the hinge with electrician's rubber tape, so it will not scratch the furniture.

Last, fasten to the rotating head of the clamp

[*Continued on page 150*]

Reveals Mysteries Of Life

[*Continued from page* 139]

plate assembly into place and hold it to the base plate with rubber bands until the solder has thoroughly set.

If the adjustment bolt is now screwed in until it rests on top of the post, further turns will raise the compression plate. Continue still further and the guide pin will be cleared, allowing the compression assembly to be swung around. Now smear the bottom of this plate, around the hole, with Plasticene modeling clay and press a rather thick, square cover glass in place to cover the opening. Put a drop of water containing the specimens to be examined in the center of the glass of the bottom plate, bring the compression plate around and engage the guide pin, then turn the adjusting screw until the top glass touches the water.

Now place the compression slide on the stage of your microscope and secure a focus on the object. Continue to turn the adjustment screw until you observe that specimens cease swimming about. This must be done very slowly as the slightest excess of pressure will suddenly burst the animal. Use a water bottle filter to absorb heat in case you make this study with artificial light, as otherwise the drop of water on the slide will soon become so hot that specimens will be cooked.

Next month we will invade the mysteries of that vast world which exists among the grass blades, getting closely down to earth with a microscope to peer into the precincts of insects, most numerous of all animal groups.

Swamp Lands Bring Fortune

[*Continued from page* 126]

sold to chemical companies for the manufacture of bromine and magnesium salts.

Additional brine is pumped into the crystallization ponds as they are drained, until the salt has crystallized to a depth of four to six inches. This period lasts from March to the first part of August, when the salt is ready to be harvested.

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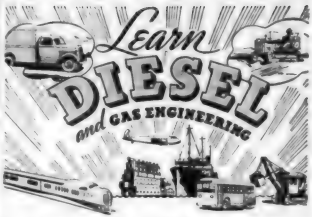

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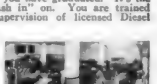
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Where Playing With Fire Pays

[*Continued from page 126*]

your invention is completely doomed. Often only minor corrections are necessary to win approval and the object is always the better for it.

In this connection, laboratory officials ask that it be clearly understood that examination is made only of products secured from the manufacturers after commercial production has been started. No consideration is given to the efficiency of a device, the concern of the Laboratories being limited solely to conservation of life and property.

Someone will possibly wonder why manufacturers themselves do not consider the problems settled here. The answer is that they do. Millions of dollars are spent by industrial organizations in research to make their products safe. But manufacturers have a different viewpoint. Primarily, their aim is to increase efficiency of operation at the lowest possible production cost. When automobiles were first built, no one was deeply concerned over the fact that spark plugs were often but an inch or two removed from the gasoline tank. The Underwriters' Laboratories changed all that.

In April, 1917, fire at Atlanta, Georgia, destroyed 1,938 buildings with a loss, including contents, of $5,500,000. Contributing to this disaster was the fact that yards and yards of city fire department hose burst at the critical moment, rendering the fire fighters helpless. Today, the fire prevention engineers have practically eliminated that trouble.

A considerable proportion of all fire hose now manufactured is submitted to inspection of the Laboratories' representatives at the factory, while further examination is made at Chicago. In the equipment provided for this purpose in the hydraulics department is a giant pump, "Goliath," capable of sending a stream of 1,250 gallons of water a minute under 500 pounds pressure to the square inch, through the standpipe system of a 100-story building.

In recent years, the market has been flooded with "bootleg" electric extension and heater cord, of sub-standard quality and, as the price is low, it represents a tremendous potential threat to the insurance business. To head off this danger, manufacturers co-operate zealously with the Laboratories to get their product certified. In 1934 alone, more than 100,000 miles of cord, enough to reach four times around the earth at the Equator, were examined and the Labratries' symbol of approval placed on it a five-foot intervals. The job possessed heroic proportions, but it is serving to safeguard millions of homes from possible loss.

One by-product of this effort was the discovery that the actual life of flexible electric cord, under tests on a special machine, was between 300 and 400 operations. Why this was true was determined and a method devised to build cord properly. Today the minimum requirement for this product is 3,000 operations and some cord is produced guaranteed up to 10,000 operations.

Douglas—Builder Of Planes

[*Continued from page 48*]

sold to the governments of Peru and Norway.

Following this, the famous "D. W. C's." (Douglas World Cruisers) were designed and built for the U. S. Army's 'Round the World' flight. Designed to be used as either land or sea craft, two of the original flight of four machines completed the jaunt around the globe, making the trip in 175 days. This flight brought the first wide spread fame to Douglas ships, and rightly so, for they were the first airplanes to ever circle the globe.

After this, the O-2, forerunner of the modern Douglas observation ships, was brought out. This craft differed from preceding Douglas designs in that radiator was streamlined into the fuselage lines instead of being left out in air stream.

It is interesting to note at this point that Douglas has built more than 800 machines of the observation type. In addition to being standard service equipment with the U. S. Army Air Corps, they are standard with the Chinese National Air Force.

While reviewing the various craft built by Douglas, mention should be made of the M-1. This Liberty-12-powered mail plane could carry 1000 pounds of mail, and was the standard plane of the Post Office Department. These machines replaced the veteran De Havilands and set a record of thousands of miles of flying over the various air mail routes of the nation before they were honorably retired from service.

Among various military types and models brought out, the C-1, T2D, PD-1, BT, P2D-1, and B-7, were outstanding.

The C-1 was an efficient Liberty-powered-biplane which was used as a military transport.

The T2D, built for the Navy, was fitted with air-cooled radial engines. It was available with either twin floats or wheels and carried a torpedo slung beneath the fuselage.

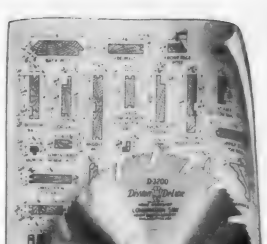
The PD-1 was the first flying boat ever built by Douglas and was used as a patrol ship by the Navy. Like the T2D, it was equipped with air-cooled engines.

The BT, a long nosed, equal span job, proved to be an outstanding basic training plane and was built in quantity for the Army.

The T2D-1, an improved version of the T2D, was also available with either floats or wheels and featured a twin rudder tail group.

In 1930, Douglas entered the bombardment field with the production of the B-7. An unconventional, gull-wing monoplane, this craft was a distinct advance over the bombing craft then in service use. The machine was powered with two 600 h.p. Curtiss Conqueror liquid-cooled engines mounted on either side of the fuselage in well streamlined nacelles. The landing gear retracted into the rear of these nacelles. The original machines of this type had a high speed of some 158 m. p. h. The later models, however, showed speeds of well over 185 m. p. h.

[*Continued on page 144*]



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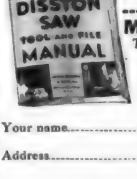

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Douglas—Builder Of Planes

[*Continued from page 143*]

Two later military developments were the 0-38 and the 0-43. The 0-38 is an equal-span biplane powered with an air-cooled engine and has a speed of over 150 m. p. h. This craft is used by many of the National Guard observation squadrons. The 0-43 is a parasol monoplane type fitted with a liquid-cooled motor and is characterized by a rather long fuselage. Both of these types have been delivered in quantity to the Army and National Guard air squadrons. The 0-46A, equipped with a radial air-cooled engine is the latest of the Douglas observation type planes.

One of the most interesting of the many Douglas military planes is the Douglas bomber. This big, twin-engined monoplane resembles the Martin bomber to some extent. It is powered with 800 h. p. air-cooled engines and 100 have been ordered for the Air Service.

Although Douglas had made his name quite well known to the world of aeronautics, he did not enter the commercial field until 1932. The reason was that up until 1929 Ford, Fokker, Boeing and Curtiss had a monopoly on the air transport market and it was practically impossible for any other manufacturer to find a buyer for transport planes. However, the commercial transport market became saturated during the period from 1929 to 1931, because few of the air line operators were in a position to replace their flying equipment.

Early in 1932, Transcontinental and Western Air Express decided to purchase some new transports and invitations for bids were extended to various aircraft builders. At once, there was a turmoil in the commercial field, with practically all of the major aircraft manufacturers striving to win the contract. At this point, Donald Douglas stepped into the picture with his DC-1. This ship readily won the TWA contract and Douglas was well launched in the commercial field.

The DC-1's were the result of careful experimentation and sound engineering. Low-wing, twin-engined monoplanes of all metal construction, these transports with their retracting landing gear were soon a familiar sight at all of the larger airports.

The DC-1 was soon improved and appeared as the DC-2. This model is one of the most efficient and popular transports ever built and it is quite probable that no other commercial airplane ever sold so quickly and so well. In addition to the fifty-eight which were sold to TWA, American Airlines, Eastern Air Transport, and Pan American Airways, thirty-four were delivered to Royal Dutch Air Mail Lines, Swissair, China National, Japan Air Transport, Spanish Air Mail, and Avio Linee Italiane S. A.

In 1936, the DC-2 was developed into the DST, 14 passenger sleeper plane, and the DC-3, a day plane with reclinable seats for 24 passengers.

The DC-4, a four-engined transport is scheduled for production during 1937.

One of the most interesting of the many Douglas developments is the Dolphin. This eight-place monoplane amphibian, powered with two 450 h. p. air-cooled engines, has a high speed of 160 m. p. h.

Designed primarily for the commercial market, this machine found but few sales and for a time it looked as though the plane would be a washout, as far as sales were concerned. However, the Army, in searching for a small amphibian transport, bought one and gave it a series of extremely hard tests. Entirely satisfied with the Dolphin's performance, the Army ordered twenty-eight. In addition to this, the Navy took delivery on eight and the Coast Guard purchased thirteen. These government sales, together with numerous sales to private individuals, made the Dolphin a very profitable model to build.

One of the latest Douglas achievements is a giant DF twin-engine flying boat. Designed for trans-oceanic flying, this ship can fly non-stop with thirty-two passengers for 1500 miles. With twelve passengers, it has a non-stop range of 3300 miles. Fitted with two 1000 h. p. engines, the boat has a high speed of 185 m. p. h. and a cruising speed of 167 m. p. h. Among the interesting features of the craft are the retractable wing floats. These hydraulically operated floats retract inward and upward into the under side of the wing.

Douglas, throughout his career as an airplane designer and builder, has been a most careful experimenter. Although he has produced several hundred planes, representing in all more than a hundred different stages of development, he has kept his designs within a few well defined types.

Since 1921, when he first started in the airplane manufacturing business, Douglas has built around 1,500 planes. The majority of these have been built for the Army, Navy, and Coast Guard (Douglas early recognized the fact that Uncle Sam was about the only reliable customer who could buy airplanes in large quantities and pay for them).

Douglas has ample reason to be proud of his planes. Beginning with his first plane, which won the Navy's competition, his craft have steadily progressed in popularity and today, they are part of the standard equipment of the Army, Navy, and major American airlines. From the little shop in Los Angeles where the Cloudster was built, his plant organization has grown until it occupies a factory at Santa Monica covering 390,000 square feet of floor space and employing some 2,000 persons.

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How To Sell Inventions

[*Continued from page 56*]

from an expensive new car. The man he wished to interest watched while he gave them a sales talk without words.

A weight of one ton was dropped on the standard car axle from a height of 40 feet. This was repeated seven times before the casing cracked. Then the new steel casing was subjected to the same test. The ton weight crashed upon it 85 times before its tough heart cracked. After that visual demonstration, all that remained was to check costs and figures.

The most convincing argument an inventor can present to a manufacturer is definite proof that a market for his invention exists. We have already seen how this worked in the case of invisible glass.

Suppose you have invented a new can opener which you hope to sell through chain stores. You can have a few gross made up, place them in local stores on consignment, and after they are sold obtain letters from the store managers recommending the can opened as a profitable item. Armed with a sheaf of these letters, you will be welcomed by chain store buyers who can be shown in cold black and white that the can opener would be a big seller in their stores.

"An inventor must not depend too much on his own opinion of his invention," Mr. Stockfeld says. The inventor is so close to his invention, and has poured so much of his heart's blood into it, that it is difficult for him to see it objectively. It is one thing for an invention to work perfectly; it is another thing for it to pass the acid test of commercial acceptability.

Yet, if he does not wish to call in outside sales help, the inventor can overcome this natural handicap if he will imagine himself to be a prospective buyer and figure out reasons why he should not buy the invention. If he has a reasonable answer for all objections, if he can turn them into positive selling arguments, then the inventor is ready to approach a prospect and not before.

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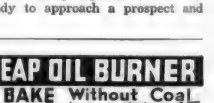

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Odd Jobs For Dynamite

[*Continued from page 44*]

determine something of the character of the strata below the surface and so obtain clues as to the possible presence of oil. Outstanding success with this method has been attained on the Texas and Louisiana gulf coast and in southern Persia in the discovery of salt domes which often indicate oil deposits.

One of the most spectacular and successful jobs ever done with dynamite was breaking up the huge counterweight of a large marine crane at Wilmington, Del. without the slightest damage to the crane itself. The counterweight was a massive block of concrete. It had defied sledges, chisels and all other tools used to chip it away. Explosives experts were called in. After a few well placed shots of dynamite, the concrete was completely broken up. The crane was later moved to another plant. A unique feature of this job was the fact that the effect of the dynamite explosions could be seen from top, bottom, sides and ends.

Dynamite is used on concrete in many other interesting ways. One of the most effective is breaking up reinforced concrete bank vaults without the slightest damage to the building. For such work, small charges, a fraction of a stick, are used for each shot. An excellent example of this type of job occurred recently in West Chester, Pa., where an unusually strong vault, reinforced with steel rods, was removed with dynamite without interrupting traffic on the street nearby or even alarming persons who passed close by while the work was in progress.

Another pioneer task done by dynamite was accomplished last year, for the first time, in cutting off piles driven deep into the sand near the bathing beach at Beach Haven, N. J. The piles were oak and chestnut and were put down with a pile driver to a depth of twenty-five feet, the original purpose being to stop erosion of the beach. It was decided to construct concrete jetties to replace the piling, but for a time the contractors were perplexed by the problem of removing the piles. Again, explosives engineers came to the rescue.

Sticks of dynamite were tied to poles and as a water jet washed out the sand, dynamite was pushed down to the required depth, well below the beach surface and shot by means of electric blasting caps and a blasting machine.

Dynamite's effectiveness in submarine work is also well illustrated in a recent job of laying pipe lines across the Trinity River in Texas.

"This waterway, which has been crossed seven times by pipe line crews, is less than 200 feet wide but in some places, it is more than thirty feet deep and the water is so discolored that one cannot see the river bottom," an engineer on the job explains.

"Before attempting to use dynamite, the men had to know what materials would be encoun-

[*Continued on page 148*]

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Odd Jobs For Dynamite

[*Continued from page 147*]

tered. They probed the bottom along the entire right of way and found hundreds of 'deadheads' and snags deeply imbedded in the mud, as well as rocks and other obstructions. First, these rocks were drilled and shot. Then bombs made up of bundles of dynamite were placed and shot to dislodge the water-soaked stumps and logs, and finally came the task of shooting the trench. A special plan was developed to meet these deep-water conditions. For lack of a better name it has been called the 'stringshot' method.

"Briefly, this involves stretching a cable across the river directly over the line of the proposed trench. To this cable, bundles of dynamite are attached end to end; and, at intervals of every few feet, small boulders are also tied on for additional weight so that when the 'string of dynamite' is prepared, it can be lowered straight down to the desired position of the river bed without being deflected by the current. This accomplished, the shot is fired, with the result that a trench of sufficient size is excavated and the pipe is easily placed in by means of a tractor and cable."

Two things in connection with this method should be explained. One is that, with the bundles of cartridges end to end, the explosion of a single cartridge in one of the bundles sets off the cartridges in all the other bundles in the twinkling of an eye, so to speak. This is called "propagation." An electric blasting cap is used for a primer, being inserted in a cartridge and fired by means of an electric blasting machine. The other point is that the section of pipe pulled across the river is composed of a number of sections already welded together to form a continuous length.

A classic in accurate work with dynamite was the taming of the Saguenay river in northeastern Quebec. Engineers were building a hydroelectric plant here but the river was too swift and deep to build a cofferdam in the usual way to turn part of the river into the new watercourse. Instead, an 11,000-ton dam of concrete was built on end, part of its weight resting no a concrete pier. The huge block was ninety-two feet high, forty-five feet wide and up to forty feet in thickness on the side, where the outline was irregular to conform to the shape of the river bottom. With 1,000 pounds of dynamite, the concrete pier was blasted away and the prefabricated dam toppled into the river, coming to rest within an inch of the estimated spot and without breaking or cracking. Three days later, the remaining water flow was completely sealed off and the work quickly resumed on the main dam in the old river channel.

Blasting out tons of muck and mud through marshy areas to speed the settling of road fills in highway construction; snuffing out oil well fires by blasts that temporarily stop the flow of

[*Continued on page 157*]

Stamp File For The Collector

[*Continued from page 87*]

without partitions. There you may keep your albums, catalogs, pamphlets and the like. One of the flat drawers in the center is for full- and part-sheets of stamps. The top drawer is recommended for this, as a precaution against accidental spilling of fluids which may be in the other drawer. Fasten one end of a shoestring near the center of this drawer bottom, and allow it to hang over the front while placing stamps in the drawer. A lift on the string will then enable you to remove any sheet you wish. Wax paper should be placed between the sheets of stamps. Many collectors are now enjoying the rebuilding of full-sheets of cancelled stamps. This drawer will afford filing space for them.

The other drawer will contain your tongs, magnifiers, perforation gauges, watermark detector, peroxide and other stamp accessories.

The compartment in the middle contains the stamp file. This may be your entire stamp collection, including duplicates; the originals being placed in an album under some definite classification, as U. S., revenues, Dutch colonies, etc.

Materials needed to make the file are: 100 sheets of white or buff 110-pound 9 by 15 inch index bristol (grain short way); 100 sheets of 28- or 32-pound 7 by 18 inch buff ledger paper; 100 filing tabs; 110 feet of ½-inch white gummed holland; a roll of gummed sealing tape such as is used in sealing packages. These items may be purchased at any print shop. Be sure to insist that the grain in the index bristol runs the short way of the sheet—if it does the file units will lie flat and hold the stamps snugly. If it does not, they will buckle, warp and fail to hold the stamps.

Fold the sheets of ledger paper end to end; these are to be the covers for the stamp pockets.

You may have the index bristol scored at the print shop if you like, and save some work, but you can do it just as well by this: If you make a scoring-rack as follows: Tack a piece of the cardboard to a table or drawing-board and mark the board where the edges of the sheet come. Beginning 1½ inches from one end, draw parallel lines across the sheet in alternate intervals of ½ and 1½ inches as illustrated in the details. The space at the bottom of the sheet will be 1 inch, and there will be 16 lines across the sheet. Lay a straight-edge along the top line and drive a brad into the board at each end of it. Move the straight-edge back so that the other edge of it is on the next line, and drive brads on that side of it. Continue until you have brads to guide the straight-edge for each line.

Remove the sheet and tack a blank one in its place. Using the straight-edge against the brads for guides, score the sheet in each of the 16 positions with a blunt table-knife. A few trials will show you how hard to bear down on the knife.

After the sheets have been scored, they must be creased along each score. The top one bends forward, the next one backward, and so on, but it will be found easier to crease first all those that bend backward and then all those that bend forward.

Lay a creased sheet face-down on the table, force the pleats into place under your hand as illustrated, and hold it down with weights while you stick three 7-inch pieces of the sealing tape on the back of it, one in the center, and one near each end. At this stage, the pleated piece should be 7 by 9 inches, and will fit into the ledger covers which you have folded.

Assemble them by first binding the edge with a ½-inch strip of gummed holland, then sticking a similar strip over the pleats and in the fold to serve as both binding and hinge. Stick the films at the top in the proper rotation to give visibility and neatness to the file.

Stamps may be placed in the pockets, and their numbers and valuation listed lightly in pencil directly under them. Duplicates may be inserted directly behind them.

Materials needed for the cabinet are:

4	pcs 14"x14"x¾" WP (white pine)-ends, partitions
2	pcs 2"x2"x24" WP } base
2	pcs 2"x2"x15" WP }
1	pc ¾" ply 8½"x11"—front
2	pcs ½" ply 6"x14"—doors
1	pc ¾" ply 14½"x23"—top
1	pc ¾" ply 14½"x23"—back
1	pc ¾" ply 6"x23"—bottom
4	pcs ¾" ply 6½"x12"—pigeon-holes, drawer bottoms
2	pcs ¾" ply 9¾"x14"—file compartment bottom and top drawer bottom
1	pc ¾" ply 9½"x14"—bottom drawer bottom

Drawer sides and fronts to fit

6 small brass hinges

7 small unfinished wooden knobs

1 elbow-hinge

8 feet of 1" copper sheeting

1 oz. brass escutcheon pins

2 small bullet-type friction catches

Railway Postal Clerks

Railway Postal Clerks get $1,900 the first year regular, being paid on the first and fifteenth of each month. ($79.17 each pay day.) Their pay is automatically increased yearly to $2,450. Advance may be had to Chief Clerk at $2,700 a year. ($112.50 each pay day.)

Railway Postal Clerk, Minneapolis, Minn

"I received my appointment as Railway Postal Clerk and have been working full time and some overtime. Your training taught me what to do and how to do it. To this training must go a large share of the credit."

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Minneapolis, Minn.

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Railway Postal Clerks on long runs usually work 3 days and have 3 days off duty or in same proportion. During this off duty their pay continues just as though they were working. They travel on a pass when on business. When they grow old, they are retired with a pension.

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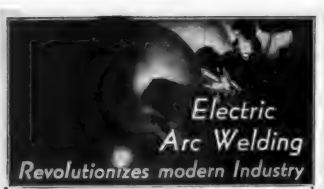

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Rays Set Up Burglar Barrier

[*Continued from page 40*]

service. It could just as easily have dialed the fire department, or summoned aid from other quarters. The invisible beams are sensitive to smoke as well as human intrusion. A small button is provided to check the apparatus so that operation can be assured before leaving the protected premises or retiring.

Previous protectional systems relying on the phototube have had to depend on a visible white beam for reliable transmission of any considerable distances, or when reflected by more than a few mirrors. A 32-candlepower lamp was placed in a projector fitted with a special filter which transmitted only invisible rays of the infrared band. The invisible beam was focused on the phototube through a special lens and holder connected to an amplifier using standard metal radio tubes. Because of its design, the system is responsive to minute current values set up in the phototube, making it possible to employ the beam over long distances, and to reflect it from mirror to mirror and effectively honeycomb a space with unseen "fences" of electricity.

To demonstrate the distance of transmission possible with the device, an invisible ray was projected from a window on the 34th floor of the G-E Building to a window on the 63rd floor of the R. C. A. Building in Rockefeller Center, a distance of approximately 1,800 feet. Every time a spectator passed his hand through the invisible beam he caused a light in the R. C. A. Building to be turned on. Even a whiff of cigar smoke was sufficient to light up the window four blocks distant.

The automatic equipment used in the demonstration was so small in size as to be almost unnoticeable. The mirrors employed were inconspicuous, and so adjusted and installed that the direction in which they reflected the beam would have been a mystery, even to an informed prowler. Disturbing these mirrors results in the alarm being sounded.

The system remains operative even though the power lines to the premises should be cut or fail. It is so arranged that a battery supply of electricity automatically trips in if the regular current is interrupted.

Build "Hollywood" Floodlight

[*Continued from page 140*]

one of the small rubber cups which are used under the legs of heavy furniture. One way of doing this is to get three of the metal "domes of silence," each a different size; bend the prongs of the smallest over the clamp head, softening the prongs first by bringing to a red heat and allowing to cool slowly if they are too brittle to bend. Place the next largest cup over this, then the largest, thus securing a large, smooth and perfectly centered bearing surface which will not cut into the rubber cup.

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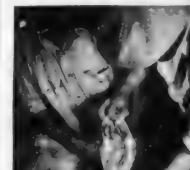
Python Gets Mouth Swabbed Daily



A king python at Frank Buck's Jungle Camp in Massapequa, L. I., requires daily swabbing of its mouth in order to prevent canker sores. Shown above are two men forcing the huge snake's mouth open for a treatment. Six more men are required to hold the 22-foot python to prevent its coiling.

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Odd Jobs For Dynamite

[*Continued from page* 148]

gas and blow the fire so high and wide that there is no flame left to ignite the gas when it starts coming out again; clearing snow from automobile highways through mountain roads; digging trenches for fences to keep foxes from escaping on fur farms; helping to build airports, golf links and to drain farms—these and many other tasks are all in the day's work for "Old Man Dynamite."

Another new use of dynamite which has great economic value for the entire country has just come into prominence largely through the government's aggressive efforts to halt soil erosion. With the aid of dynamite, thousands of CCC men are now engaged in what is known as gully control work.

Millions of acres of land have been made worthless by gullying, the effect of water tearing away the soil on slopes. This is being corrected on a large scale by the use of dynamite in a new form, a "free running powder," it is called, or dynamite in granular instead of stick form. The powder comes in bags and is poured into holes for the blast. It is set off with a stick or part stick of dynamite detonated by an electric blasting cap. A pint of the powder equals a pound, thus enabling the engineers to do accurate work.

Objectives in gully bank blasting are to deposit a sufficient quantity of topsoil on the gully bottom so that trees, bushes and grass may be planted there to prevent further erosion and to keep this topsoil, so deposited, from washing away, by constructing soil-saving dams at carefully selected points in the bottom of the gully. All this involves the moving of thousands of tons of soil, a job which is made practical and more effective with the aid of "Old Man Dynamite."

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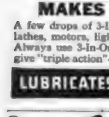

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Car Overhauled After Trip

[*Continued from page 118*]

accounts for the valve seats not being in a perfect plane, check carefully into the matter of cooling.

That is just part of the valve job. Look into the guides and make sure they are not gummy. It may be necessary to ream them a little to cut out incrusted deposits. If there is excessive carbon and gummy substances in the guides the chances are that they are badly worn and should be replaced. Leakage of air through the guides will lean out the mixture from the carburetor and prevent the engine from idling evenly.

Valve work is now most efficiently done with the aid of special equipment. Much attention is paid to the matter of keeping the valve seats to the width originally specified by the manufacturer. Factory specifications for valve spring tension and tappet clearances are also carefully observed. Without sufficient clearance valves hold open and burn when the engine heats up on a hill; with too much clearance the valves do not lift high enough and the pistons do not suck in the normal quantity of fuel vapor. It is important to avoid letting grinding compound work into the cylinders or into the openings to the water jackets.

Speaking of these openings, remember that they are sized so as to help control the rate of flow of water through the cooling system. Their tendency is to become smaller in size by reason of an accumulation of rust and scale. A reamer may be needed to cut these openings to their original size. There is little likelihood that the engine would overheat by reason of one of these openings being partially clogged, but it's clear that restriction of the water may cause the temperature to rise at some particular point. This might warp the block or, even in a mild case, warp one of the valves.

It is well to remove the side cover plates of the engine block and manually scrape out the scale. It is this scale that is so difficult to dislodge by the usual flushings. But before putting back the head, better check the cylinders themselves for out-of-round and taper. For an engine to run properly after a re-grinding it is necessary that the cylinders do not vary more than .001-inch as to roundness. The cylinders must also be straight and absolutely square with their base. This is work for the very best of mechanics, and any engine that has been reconditioned to this extent must be broken in even more carefully than when new.

For most motorists it will be a problem of fitting new rings. Trying to make round rings fit into cylinders that are not true comes close to the fallacy of fitting round pegs into square holes. Expanders have come into wide use as a means of helping to achieve this impossibility, but care must be taken in using such expanders. If there is too much pressure on the walls the engine will lack pep and may wear still further

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at an increasingly rapid rate. Also if the ring grooves are worn the expanders, in pressing the rings more tightly against the walls, will increase the space behind the rings. Oil can work by at this point very freely. That is one reason why engines so often use more oil after a ring job than before. This can be avoided by cutting the ring grooves deeper and by fitting with thicker rings.

In replacing rings be sure that the joints are open far enough. The minimum opening is .010" for 3" rings to .015" for 4" rings. If the cylinders are oversize the ring joint can be opened to 1/8". Other points include careful measurements of the piston lands and skirts. More clearance is required at the ring lands because they are up where there is more heat. For cast iron pistons the skirt clearance should be at least .001" per inch of piston diameter. Split-skirt or Invar-strut aluminum pistons need a skirt clearance of at least .0015". Plain trunk type aluminum pistons require at least .0025" per inch of piston diameter.

After the head is replaced see that the engine's cooling system is reverse flushed. The radiator should not be connected during this part of the process. The object is to get rid of the scale, not to drive it into the radiator core as most motorists do. Finally, reverse flush the radiator by itself. The whole engine should be thoroughly hot when these jobs are performed. After the flushings always check the radiator core to see if it will carry off water quickly. Pour water into the top of the radiator and see how quickly it escapes at the bottom. Replace both hose connections. After the system is joined, note if the lower water hose tends to collapse when the engine is accelerated. Any such tendency indicates that water isn't getting down through the radiator core fast enough.

In some cases it is well to insert a metal coil in the lower water hose to keep it from collapsing. A further check on the system is had by looking into the radiator top when the engine is accelerated. The water level should not rise. Sometimes a bent or loosened baffle plate at the top of the radiator will cause water to spill out the overflow when the engine is raced. The check-up should also include the motor thermostat. Replace this if it is more than three years old, or if it is badly rusted or in any way inefficient. Its action can be tested by putting it in cold water which is then heated to the boiling point. Put in a new thermostat if the old one is discarded. A thermostat is needed for efficient operation, especially in cold, or even cool, weather.

In the modernized overhaul be sure to drop the crankcase and remove all traces of sludge in the engine's lower extremities . If the bearings are loose or worn this will be indicated by a gradual drop in the oil pressure reading. It is well to check up the pressure regulator, however, before jumping at conclusions regarding

[*Continued on page* 161]

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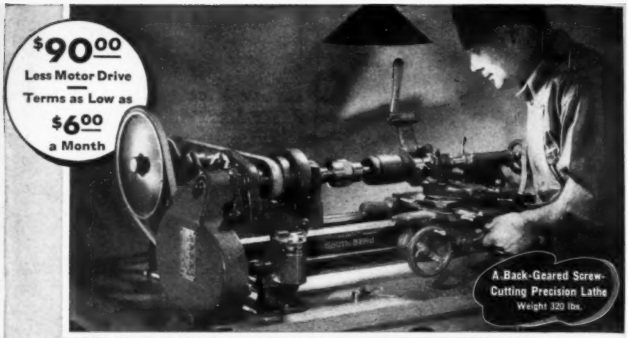

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Car Overhauled After Trip

[*Continued from page 159*]

the bearings. If there is wear on the rear main engine bearing there will be leakage of oil into the clutch housing.

Such clues are helpful in studying the engine's condition. A loose timing chain, for instance, will slap against the inside of its case. If too tight it will hum.

The carburetor can stand an overhauling, but at least see that it is clean. This includes cleaning the acceleration pump and the jets. It is well also to have a look at the float chamber, the needle valve, its seat and the float mechanism. Check the float for leakage. If the needle valve is changed be sure to replace its seat as well. See that the gasket on top the float chamber is tight. Looseness here accounts for many cases of high gas consumption.

With fixed jets in the carburetor there is only the idling mixture to adjust after the overhaul. Be sure the engine is warmed up before doing this. At this point also go over the valve tappets again to make sure that they are evenly adjusted and spaced properly for the temperature valves often cool off while the engine is being checked over.

Valve timing is not likely to change unless the timing gears or chain are replaced carelessly. Ignition timing, however, can go late quite easily. This invariably occurs right at the distributor. So check timing carefully, keeping the spark advanced so that you can just barely get a ping from the engine when accelerating sharply even with anti-knock fuel in the tank. Replace, don't file or stone, the breaker points. Replace all plugs with those of the correct heat type, but be sure the points even of the new plugs are given the correct gap for the particular make and model car. Test the breaker arm spring for tension.

In overhauling the car don't forget to have the springs re-arched and the shock absorbers serviced. It is not enough merely to add fluid to the latter. There may be wear on the moving parts of the shock absorbers, particularly if these units have been operating without a sufficient supply of fluid. On some cars the shock absorbers can be refilled while on the car, but this can be done correctly only if the owner rocks the car by jumping on the bumpers. Some movement of the shock absorber arms is needed to remove air pockets while fluid is being added.

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Fire fighting is a new side line for policemen in Schenectady, N. Y. Police cars equipped with two-way radios have been arriving at fires so quickly—in some cases ahead of the fire engines —that the cars are now to be equipped with fire extinguishers, so the policemen can go to work on the fire.

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Expanding Business Greets New Ideas

A new metal awning can be changed from inside the window from a vented awning to a no-draft ventilator. It will protect the window from invasion when the house is vacant.

A coal stoker feed made from cold rolled steel "wrapped" around a core.

A new edition of "How To Run A Lathe" containing the latest and most authoritative information about the fundamental operations of modern lathe practice.

A moulded bakelite cribbage board with a built-in ash tray.

A metal cleaner for removing the hardened and burned substances from pots and pans.

A light fixture which not only supplies light but catches flies as well.

Synhetic rubber coated overalls and dungarees.

An attic ventilator requiring no cutting of holes or alteration for installing.

An indicating wrench for uniformly tightening nuts and stud bolts. A dial, which accurately indicates tension, is an integral part of the wrench.

A portable electroplating outfit capable of being carried in the tool kit.

A fuse clip clamp to reduce resistance at point where fuse clips into circuit.

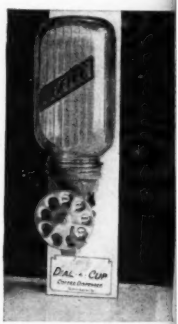
A specially designed drinking mug featuring two compartments, one for holding a liquid and another to hold ice for keeping liquid cool.

A caster wheel parking jack for trailers has sufficient lift for coupling or uncoupling at all times.

A bucket chain made of heat treated Austentic manganese steel for strength, toughness and wear resistance. Links have tiebar to prevent snarling and kinking.

An extremely small switch operating from the front. For use in oil burners and other devices where a small switch is desired.

A photo projector offering camera owners an opportunity to project their "still" pictures on a screen.



An automatic coffee measurer and dispenser. It is operated by twirling the dial under the jar.

Editor's Note—Addresses of manufacturers of these and other new products in this issue can be obtained by sending a stamped, self-addressed envelope to Modern Mechanix Publishing Co., Information Bureau, Fawcett Building, Greenwich, Connecticut. Manufacturers are invited to submit material for publication on this page.